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STUDIES IN DEVELOPMENT AND LEARNING

CONTRIBUTIONS FROM THE DEPARTMENT OF PSYCHOL-
OGY AND CHILD STUDY IN THE FITCHBURG NORMAL
SCHOOL, MADE BY THE ADVANCED CLASS OF
1907, AND EDITED

BY
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ARCHIVES OF PSYCHOLOGY

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PREFACE

The students of the advanced or four years course in the Fitchburg Normal School are required to write a thesis during the last year on some subject connected with psychology or child study. They usually collect data and treat them statistically. This year the data, consisting largely of a series of measurements and tests made upon the six hundred children in the training school during the last five years, were of more value than usual, and it was thought best to print parts of a number of the theses, with an introduction and supplementary comments by the head of the department. Only those parts of the theses that are of general psychological and pedagogical interest are included. Complete theses would doubtless be of interest to some who are interested in knowing the value of thesis writing as a method of training elementary teachers, but to have published in full would have made the monograph too large and detracted from its interest to psychologists. All unnecessary details therefore, together with some suggestions of practical applications, are omitted. With very few minor exceptions the language of the students is unchanged. All the theses were accompanied by references, but as most of them were incomplete, including only material well known to psychologists, they are omitted. The editor when necessary has prefaced each thesis with an explanation of the tests on which it is based, and followed each with brief *comments*.

It may be of interest to remark that the past year nearly all of the advanced class, instead of taking a general topic for study, took a concrete case of a child backward in one or many lines and tried to improve him, accompanying the teaching by reading and by carefully kept records of what was done and the results. This studying of individual children in order to teach them more effectively proved to be of much more value and interest than the mere studying of individuals without expecting to do anything for them.

E. A. KIRKPATRICK.

FITCHBURG, MASS.,
November, 1908.

STUDIES IN DEVELOPMENT AND LEARNING

THESIS I 1925 PHYSICAL TESTS AND MEASUREMENTS

BY LILLIAN G. MYERS

Editor's Explanation.—The data regarding physical development summarized in the tables that follow were taken about the first of October of each year by the Normal students under the direction of the head of the Department of Child Study. One or two students usually took charge of each instrument and made the tests and measurements of all the children as they passed along the line. The ordinary clothing at that season of the year was worn by the children except that the boys were asked to remove their coats while being weighed and measured. At first shoes were also removed, but later this was given up. The head of the department tried to secure accuracy in measurement but of course there were slight errors due to the personal equation of those taking the measurements at different times. Larger errors, due to the mishandling of an instrument, sometimes occurred but were usually discovered and corrected before many measurements were made. Although not quite as accurate as measurements made by experts the sources of error are not large enough to vitiate the general results. In the grip test an adjustable dynamometer of the Smedley type was used, which gives a higher record especially for small children than the ordinary non-adjustable instrument. The tests of chest expansion and of lung capacity are not always correct indications of the strength of individual children, especially of the lower grades because they do not know how to empty and fill the lungs to the extent that they are capable of if they only knew just how to do it. Sometimes a determined effort to contract the chest results only in rigidity or actual expansion. Better results are usually obtained by letting the children imitate other children or the experimenter than by telling them what to do and urging them to do their best.

Thesis.—(As the facts discussed in this thesis are of a familiar character only the table is here reproduced.)

TABLE I
PHYSICAL MEASUREMENTS AND TESTS

| Ages | Girls | | | | | | | | Boys | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|-------|-------|-------|-------|------|-------|
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Number..... | 40 | 40 | 40 | 40 | 40 | 40 | 30 | 10 | 40 | 40 | 40 | 40 | 40 | 40 | 30 | 10 |
| Weight..... | 20 | 22.9 | 25.1 | 26.8 | 29 | 32.5 | 37.6 | 41.3 | 21.4 | 23.5 | 25.1 | 27.5 | 30.3 | 32.4 | 34.6 | 38.5 |
| Height standing.... | 113.5 | 120.8 | 125.9 | 130.3 | 136.3 | 142 | 147.9 | 154 | 115.4 | 121.8 | 126.2 | 130.4 | 135.6 | 139.7 | 144 | 148.4 |
| Height sitting.... | 61.4 | 65.3 | 67.5 | 69.2 | 72.4 | 73.4 | 75.5 | 80 | 62.7 | 65.2 | 67 | 68.7 | 70.7 | 72.4 | 73.5 | 75.7 |
| Breadth of head.... | 14.1 | 14.1 | 14.1 | 14.2 | 14.3 | 14.4 | 14.5 | 14.7 | 14.2 | 14.3 | 14.5 | 14.6 | 14.5 | 14.6 | 14.8 | 14.8 |
| Breadth of chest.. | 18.3 | 18.8 | 19.4 | 20.1 | 20.4 | 21.1 | 22 | 22.4 | 18.9 | 19.5 | 20 | 20.9 | 21.3 | 21.6 | 21.7 | 21.8 |
| Breadth of waist.. | 16.5 | 17.6 | 18.3 | 18.7 | 18.9 | 19.3 | 19.5 | 19.2 | 16.6 | 17.5 | 18.7 | 19.7 | 20.2 | 20.3 | 20.2 | 19.3 |
| Girth of head.... | 50.6 | 51.7 | 52 | 52.4 | 52.7 | 52.7 | 53 | 52.6 | 51.3 | 51.7 | 52.6 | 53.2 | 53.3 | 53.4 | 53.4 | 53.9 |
| Depth of chest.... | 14.6 | 14.9 | 15 | 15.7 | 15.8 | 16.2 | 16.9 | 17.2 | 15 | 15.4 | 15.5 | 16.2 | 16.4 | 16.7 | 17.2 | 17.8 |
| Chest expansion.. | 5.0 | 5.6 | 7.2 | 6.4 | 7.4 | 7.9 | 8.4 | 8.3 | 5.2 | 6.0 | 7.2 | 7.4 | 7.6 | 8.6 | 8.1 | 8.5 |
| Lung capacity.... | .67 | .92 | .95 | 1.11 | 1.20 | 1.41 | 1.50 | 1.34 | .80 | 1.07 | 1.18 | 1.43 | 1.54 | 1.72 | 1.87 | 1.86 |
| Grip, right..... | 9.9 | 12.1 | 13.4 | 13.8 | 14.9 | 18.3 | 20 | 22.5 | 12.2 | 14.5 | 15.8 | 18.8 | 18.9 | 20.9 | 22.2 | 21.6 |
| Grip, left..... | 10.1 | 12.4 | 13.3 | 14.3 | 15.2 | 17.2 | 19.9 | 20.6 | 12.3 | 14.1 | 14.9 | 17.5 | 18.5 | 20 | 21.7 | 20.7 |

Editor's Comment.—These tables may best be compared with those of Professor Hastings in his “Manual of Physical Measurements” since the instruments and methods used were similar. With very few exceptions these tables are higher for both boys and girls at all ages than those of Professor Hastings though in most cases where there is no difference in the instruments and the mode of taking the measurements, the difference is very slight. His tables are based on more children but these have the advantage of being based in a large measure upon the same children at different ages.

The differences in height and weight which, according to the tables, place eastern children about one year in advance of western in those respects is partly, but perhaps not wholly, accounted for by the fact that our children retained their shoes, while those measured under the direction of Professor Hastings did not.

In height sitting the differences are slight, also in breadth of head and girth of head, but in breadth of chest and of waist they are somewhat greater, while in depth of chest the difference is very marked amounting at nearly every age to two or more cm. This can not be accounted for by any difference in clothing or mode of measurement so far as we know. It seems to indicate a marked physiological difference between eastern and western children.

Chest expansion and lung capacity correspond pretty well, considering the difficulty of making accurate tests of children who have had little or no practice in controlling the muscles of chest and lungs.

The difference of from two to six kilograms in the strength of forearm, as indicated by grip, can not be wholly accounted for by the adjustable dynamometer used by us, for our records are some-

what higher than those of the Chicago Child Study Department where the same instrument was used. The fact that many of our children had taken the test one or more times may have given them some advantage. In one other respect our results are peculiar, *i. e.*, in the relative strength of right and left hands. In our tables the figures for the left hand are relatively high at all ages, and up to nine years of age are absolutely higher than for the right hand. Others have found the right hand slightly superior at six and markedly so after twelve.

It was hoped that these tests, carefully chosen for their close relation to development and health, would be a valuable means of diagnosing the condition and progressive development of individual children, but this hope has been realized only in part. In averages of the measurements of a number of children, errors due to slight difference in clothing and to the personal equation of different persons who make the measurements, and to the variation in the intelligence and intensity of effort on the part of the children in the strength tests, are likely to cancel each other. In individual cases, however, the figures recorded for the same child in successive years may often be misleading. This is true of the vital strength tests and the measurements of breadth of chest and waist. In such measurements as those of girth of head and breadth of head, although the probable error of measurement is not great, yet the change from year to year is slight and may be less than the error of measurement.

If the same person made all these measurements and tests year after year in the same way, the records would doubtless be very significant of the actual development of individual children, but where different persons have handled the instruments and directed the efforts of children who have not practiced the tests, the records can not be implicitly relied upon as showing variations in the individual though any marked individual variations from the normal are clearly shown, and the averages are fairly reliable.

In the case of measurements of height and weight the facts are somewhat different, for the changes from year to year are well above any probable error due to the personal equation of the measurers or to slight variation in clothing (if the measurements are made at the same time of the year).

THESIS II

DEVELOPMENT OF AUDITORY AND VISUAL MEMORY

BY MARY J. CONWAY

Editor's Explanation.—The data regarding memory discussed in this thesis were taken each year at about the same time by the head of the Department. Cards with from three to nine figures of good size were used for the visual test and similar series of spoken numbers for the auditory test. In both cases the time occupied was between one and two seconds for each digit. In the lower grades series of from three to six digits were given, while in the upper grades series with two or three more digits were also given. The same number of digits was given two or three times. In marking, no credit was given except for series that were correctly reproduced in the proper order. Averages were not made but each pupil was credited with the highest number of digits that he reproduced correctly every time that many digits were given him. This was taken as his standard memory span while variations from this standard, due to fluctuating attention and other causes were indicated by plus or minus the excess or deficiency. For example a boy who reproduced six digits every time that number was shown, but failed once on five digits and succeeded on one of seven and one of eight digits was marked $6 + 1 + 2 - 1$. Such extreme variation as this was of course rare. Had four or five series of each number of digits been used the standard alone would probably have been a good indication of the individual mental span. The children were always very much interested in this test, and though pains was taken to prevent them from beginning to write before the series was complete or from looking on the paper of some other child, yet a few incorrect records due to these causes were doubtless included. Some errors were probably also made by the student teachers who looked over the children's papers and recorded the results. Such sources of error however would not apply to one age or sex more than another and hence would not affect the comparative averages.

Thesis.—The results of the tests taken, when tabulated, show what has been proved by other tests and what is learned by ordinary observation, that the memory span, or the power to reproduce impressions just received, increases with age to a marked degree.

These same tests had been taken on the students at the Fitch-

burg Normal School and the average of 103 students was 6.3 for the auditory and 7.3 for the visual record in the first test, and the average of eight who took the test a second time is 7.2 for the auditory and 8.5 for the visual. These show a slight superiority over the record of the children in the grades.

Older pupils have the advantage in a memory test, because no test that can be given is so new to them as to the child. In another test in this school where some adults who were unacquainted with Greek and some children were tested with the Greek letters, the adults' record did not show much gain over the children's. Even in this case, although the letters were unfamiliar to the adults, still they could see their resemblance to other symbols more readily than the children and they still had the advantage.

Development of memory is really a training of the mind, in the power of concentrating the attention and of associating the new with the old.

TABLE II
INCREASE IN MEMORY SPAN

| | | <i>Auditory</i> | | | | | | | | |
|-------------|--|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Ages. | | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Boys, No., | | 8 | 56 | 63 | 56 | 62 | 51 | 40 | 26 | 18 |
| Average, | | 3.8 | 3.9 | 4.2 | 4.6 | 4.9 | 5.5 | 5.1 | 5.6 | 6.0 |
| Girls, No., | | 15 | 54 | 71 | 65 | 79 | 53 | 38 | 30 | 5 |
| Average, | | 3.6 | 4.1 | 4.3 | 4.8 | 5.0 | 5.3 | 5.5 | 5.8 | 5.0 |
| | | <i>Visual</i> | | | | | | | | |
| Boys, No., | | 10 | 48 | 62 | 58 | 66 | 52 | 19 | 26 | 7 |
| Average, | | 3.1 | 3.8 | 4.0 | 5.0 | 5.6 | 5.9 | 5.4 | 5.0 | 5.8 |
| Girls, No., | | 14 | 48 | 63 | 74 | 71 | 53 | 40 | 25 | 3 |
| Average, | | 3.4 | 3.6 | 4.5 | 4.9 | 5.5 | 6.0 | 6.1 | 6.3 | 6.0 |

Table II. shows the average memory span of children of different ages, age six meaning more than six and less than seven, and the same for other ages. Fig. 1 shows the same as the table, except that allowance has been made in the figure for the "variations" from the standard records (see above, p. 31). One third of each variation is added to or subtracted from the standard.

With the boys from six to nine the auditory memory is better than the visual, with the girls from six to eight the same is true showing what has been proved by other tests that younger children remember better what they hear, probably because of the fact that before a child enters school he receives most of his ideas through the auditory sense, while the experience that the child gets in the school room teaches him visual language, and this learning of words and numbers visually gives him a tendency to represent things visually.

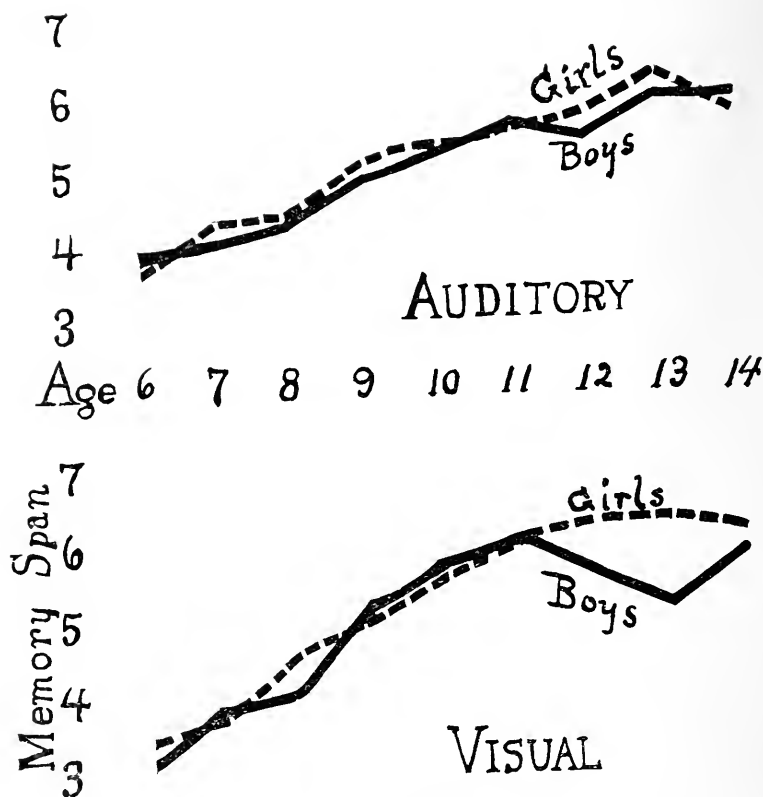


FIG. 1. Increase in Memory Span.

From the ages of eight and nine to fourteen the visual memory is better than the auditory. In the tests taken upon Normal School students the same is true.

The auditory memories of girls from six to eleven are better than those of boys, from eleven to twelve both records are the same, from twelve to thirteen the record of the girls is better than the boys again, but at fourteen the curve of the boys is above.

In the visual curve the girls record is higher than the boys except from eight to nine where the boys' record is better. From ten to fourteen the record of the girls is very much better than of the boys.

Generally speaking the curves seem to indicate that the memory span or immediate memory of girls is better than that of boys.

The preceding table and curve show the average memory span of children, not all of whom were the same at the different ages. An attempt was also made to trace the gain of the *same* children

from one year to the next—which could be done to some extent, as three or four successive tests had been made on a good number of them. The records for each individual for the three or four successive tests were examined, and if there was a gain from one year to the next it was marked *plus* and if there was a loss it was marked *minus*. The results are shown in Table III., which gives the average gain both in the “standard” record (see above, p. —), and in the record when allowance is made for the “variations.” The numbers under each age give the gains in the year preceding that age.

TABLE III
MEMORY SPAN

| | | <i>Auditory</i> | | | | | | | | | | | | | |
|-------------|-----|-----------------|-----|-----|-----|-----|-----|-----|-----|----|-----|------|-----|-----|--|
| Age. | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 | |
| Girls, No., | | 3 | 6 | 11 | 6 | 31 | 5 | 25 | 4 | 15 | 3 | 15 | | | |
| Standard, | | .3 | .5 | 1.1 | .7 | —1 | 1.6 | .5 | | .2 | 2.0 | .6 | | | |
| Variation | | | | | | | | | | | | | | | |
| combined, | | .3 | .3 | 1.4 | 1.7 | .1 | 1.2 | .3 | | .4 | 2.1 | 1.3 | | | |
| Boys, No., | | 5 | 3 | 25 | | 25 | | 12 | 2 | 8 | 4 | 9 | 1 | 5 | |
| Standard, | | .2 | 1.0 | .8 | | .9 | | 1.1 | 1.0 | .9 | .3 | —1 | 2.0 | .8 | |
| Variation | | | | | | | | | | | | | | | |
| combined, | | .3 | 1.1 | .9 | | .6 | | .9 | | .3 | .3 | —1 | 1.7 | .3 | |
| | | <i>Visual</i> | | | | | | | | | | | | | |
| Girls, No., | 2 | 5 | 5 | 15 | 7 | 25 | 8 | 18 | 3 | 12 | | 16 | 3 | 2 | |
| Standard, | 1.0 | 3.0 | .4 | .9 | .1 | 1.0 | 1.0 | 1.0 | 1.3 | —3 | | —3 | —7 | .5 | |
| Variation | | | | | | | | | | | | | | | |
| combined, | 1.0 | 2.7 | —1 | 1.0 | .3 | 1.0 | 1.0 | 1.0 | 1.4 | —5 | | 0 | —1 | .7 | |
| Boys, No., | | 3 | 3 | 20 | 5 | 17 | 7 | 10 | 3 | 13 | 6 | 11 | 3 | 2 | |
| Standard, | | 1.3 | —3 | 1.1 | 1.4 | 1.5 | 1.3 | 1.3 | 1.3 | .3 | —2 | —6 | —7 | 1.0 | |
| Variation | | | | | | | | | | | | | | | |
| combined, | | 1.1 | 1.1 | 1.1 | 1.2 | 1.5 | 1.1 | 1.3 | 1.6 | .4 | —4 | —1.0 | —6 | .7 | |

In the auditory memory of the girls there is a marked gain to nine and a half, then at ten there is a loss with a gain from twelve to thirteen.

In the visual memory of the boys there is a very marked loss at thirteen the same as with the auditory.

In the visual memory of the girls there is a loss between eight and nine but a more marked loss at twelve.

In the visual memory of the girls there is a loss between eight and nine but a more marked loss at twelve.

In each case there seems to be a difference of from one to three years in the time when this retarded growth of memory comes to the boys and girls, the retarded growth coming earlier in the girls in each case.

This corresponds with the studies which have been made of the bodily growth of children, since there is a diminished rate of growth in girls about ten and in boys about twelve with a rapid growth afterward.

This matter of memory span is very important in the learning of spelling; the fact that some children fail repeatedly in their spelling may be because those children have a poor visual or auditory memory.

If we remember that there is a limit to a child's mental grasp we shall be careful about the length of directions which we give him and will not think a child stupid because he does not take in very many directions at once. In giving a dictation lesson the number of words dictated at a time should be determined by the child's age and mental grasp.

The primary teacher should remember the fact that the younger pupils are more ear minded than eye minded.

Since an impression is more lasting if it is received through two senses at once, the teacher should see that the pupils receive both visual and auditory impressions of facts as much as possible. In fact these principles are applicable to everything we teach.

Editor's Comment.—With many, and probably most persons the number of things that can be held in mind at one time, or that can be grasped and immediately reproduced, is very definitely limited, at least for any particular kind of mental content. The determination of such limit for an individual at a particular stage of development is therefore a practicable and important means of measuring certain forms of his individual mental ability. These tests indicate that such limits or standards may be determined by only a few tests, since a large number of children can remember just so many digits, and uniformly fail when more are given. It is probable that most tests of *individual* mental ability would better be directed toward determining the limit of power under usual conditions, instead of averages of a large number of experiments. Variations from these limits should not be fused with the ordinary limits by averages but kept separate and interpreted as signs of variation, which is such a marked feature of some lives and comparatively rare in others.

THESIS III

THE DEVELOPMENT OF CHILDREN IN QUICKNESS OF PERCEPTION AND MOVEMENT

BY SADIE E. LAMPREY

Editor's Explanation.—The Perception Motor test consisted of making with a pencil one hundred marks in fifty squares in each of which was the figure 1, 2 or 3 to indicate the number of marks to be made. Students supervised the tests of individual children, recording the time in seconds from an ordinary watch, the children being encouraged to work as rapidly as possible. Since this test was made at the same time as the other tests, about a month after school began, many of the first grade children were not familiar with figures. Those who were not were taught how many marks the figures told them to make and when they could tell correctly how many marks they were going to make in various indicated squares the test was begun. In general the errors were so few as not to be worth while keeping account of. Children who could not learn or were so slow that they could not complete the test in five minutes were excused, their cards being marked "x." There were only a few such children and in every case they were children who were not capable of doing successfully the regular school work. Children sometimes stopped to rub out an extra line they had made or to see what some one else was doing, but were always reminded by the student in charge to go on marking as fast as possible. The sources of error due to such cases as these were large in the case of the smaller children, but much less for the larger children.

Thesis.—The data upon which this thesis is based consist of the complete records of ninety boys and ninety-five girls who were tested at least four times. Besides these there were records of about two hundred and fifty children, who had taken the tests a less number of times. As an aid in getting at the conclusions, this supplementary list was sometimes used as will be explained later.

In one set of tabulations the results of *all* the children taking the first test were tabulated according to age and sex; here the comparison is between *different* children at different ages. In the other tabulations the *gain* of each child over his own previous record is the basis of tabulation. The two tables agree fairly well as to the periods of greatest gain.

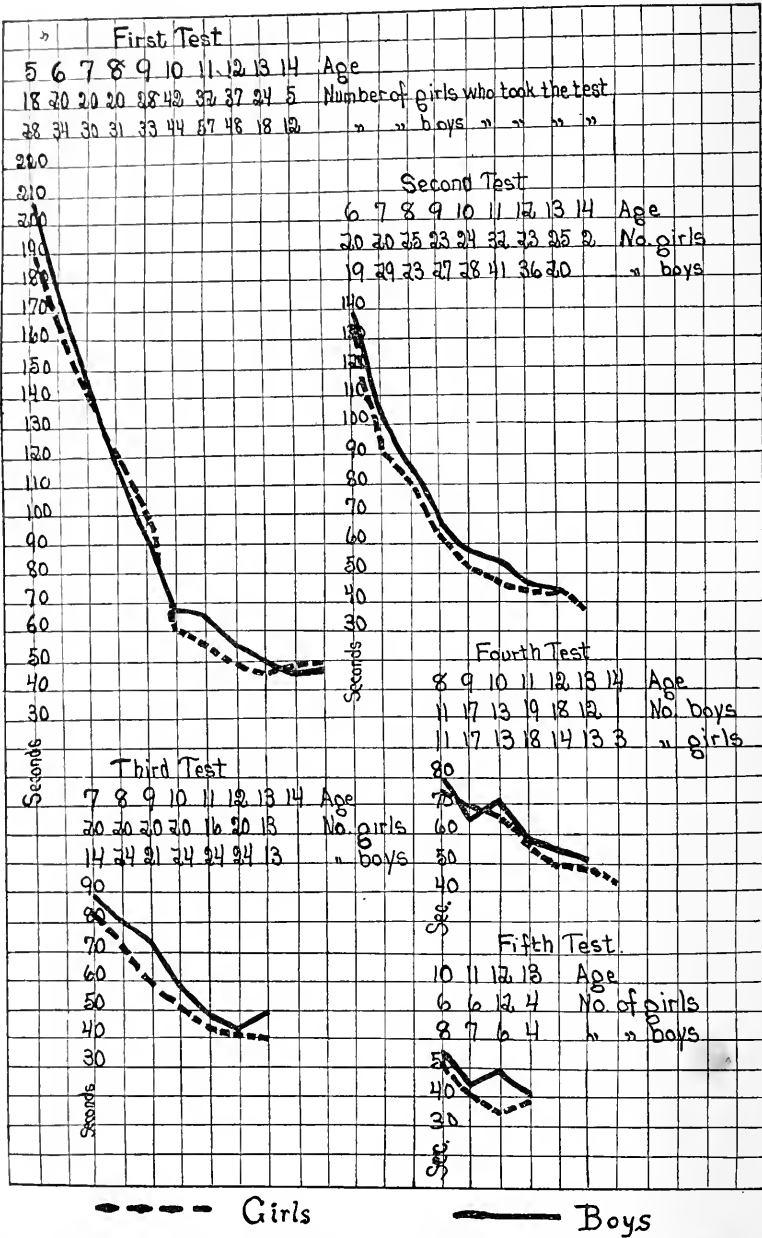


FIG. 2. Time Occupied in the Perception-motor Test at Different Ages, and at First to Fifth Tests.

The progress in rapidity according to this test may be divided for each sex into three periods, the time of greatest growth, the time of next greatest, and the time of least. With the girls the first period extended from five to nine, the second from nine to eleven, the third from eleven to fourteen. With the boys the first period extended from five to nine, the second from nine to twelve, and the third from twelve to fourteen. The complete arrest of growth with the girls came from twelve to thirteen, a year younger than with the boys. The average of the 335 boys of all ages was 86 seconds, while of the 246 girls was 78 seconds, showing that girls were better in this test than boys. The only ages in which the boys did not require more time than the girls were those of thirteen and fourteen.

The results of the second test correspond in a general way with those obtained in the first. The ages of the boys ranged from six to thirteen, and of the girls from six to fourteen, though the number taking the test at fourteen was only two.

The most important thing to be noted is the fact that the girls failed to improve from eleven to thirteen and especially from twelve to thirteen. With the boys this failure in improvement began at the age of twelve, but the data do not cover the fourteenth year, so that this can not be traced any further.

An interesting thing in comparing the averages of the first two tests for the corresponding years is the fact that with the practice gained in the first test came added ability which carried over the interval of a year so that children taking the test the second time were superior to those of the same age taking it the first time.

The total average for the 194 girls taking this second test was 66 seconds; for the 223 boys, 70 seconds.

The third test which included children of the ages seven to thirteen showed a curve something like those of the first and second tests. In the case of the girls the arrest came at the formerly found period—from eleven on. With the boys there is a loss from the age of twelve to thirteen. The average time required by the 129 girls was 58 seconds, by the boys 61 seconds. There was a slight gain in the ability of the children of different years in the third test over the ability of those in the corresponding years in the second test, though the difference was not as great as was that between the first and second tests.

The curves for the fourth and fifth tests are given, though the number of pupils in comparison with those in the first are so few that the results are less reliable.

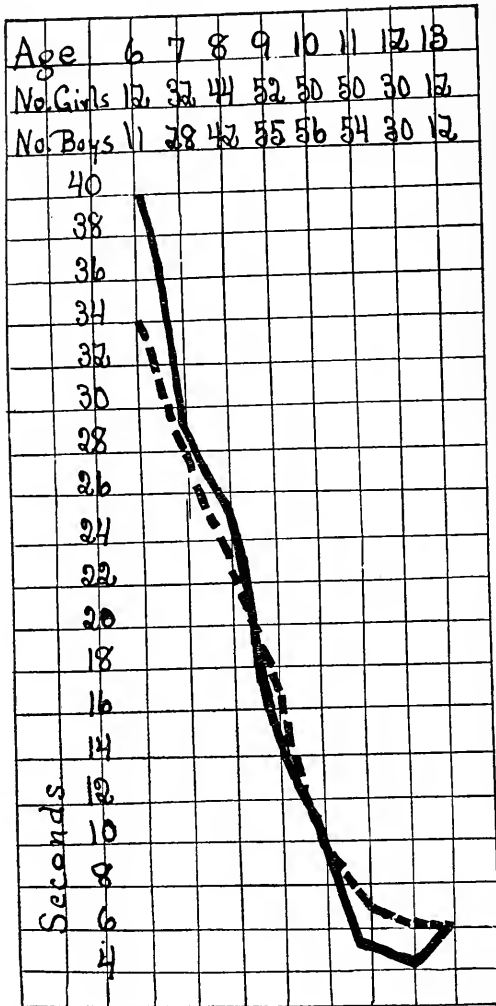


FIG. 3. The Perception-motor Test. Gains of individuals from year to year.
Broken line for girls, solid line for boys.

In the second tabulation the result sought was the gain of the children over what they were themselves a year before.

With both boys and girls the gain was much greater in the earlier years than in the later. From eleven on, the girls practically made no gain. This slackening of development in the boys came from twelve on. Both sexes suffered actual loss at one period: the fourteen-year-old girls over those of thirteen, and the fifteen-year-old boys over those of fourteen. The greatest gain in both sexes of one age over the preceding was of those of six over those of five, the gain of the girls being 35 seconds, and of the boys, 39 seconds.

In order to find out if practice actually did influence the results of the successive tests, the gain in time of boys and girls in the second test over the first, in the third over the second, and the fourth over the third, was reckoned and divided by the number in each case taking the test. The average gains for the boys were respectively 21, 15 and 13—for the girls 20, 14 and 11. Practice must therefore have aided.

Other experiments show that with continuous special practice the improvement in this perception motor test is rapid. These experiments were made upon a group of normal school students and upon two children. As a result of the practice, the decrease in time after ten trials was 18 per cent. for the normal school students, 20 per cent. for the seven-year-old girl, and 25 per cent. for the five-year-old boy.

TABLE IV

TIME FOR THE PERCEPTION-MOTOR TEST, REPEATED ANNUALLY

| <i>Girls</i> | | | | | | | | | | |
|--------------|-----|-----|----|----|----|----|----|----|----|----------------------|
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Age in years |
| 18 | 20 | 20 | 20 | 28 | 42 | 32 | 37 | 24 | 5 | Number taking test 1 |
| 194 | 140 | 118 | 95 | 62 | 57 | 50 | 47 | 48 | 47 | Average time |
| | 20 | 20 | 25 | 23 | 24 | 32 | 23 | 25 | 2 | Number taking test 2 |
| | 132 | 91 | 79 | 61 | 52 | 47 | 45 | 44 | 37 | Average time |
| | | 20 | 20 | 20 | 20 | 16 | 20 | 13 | | Number taking test 3 |
| | | 85 | 74 | 62 | 51 | 43 | 42 | 40 | | Average time |
| | | | 11 | 17 | 13 | 18 | 14 | 13 | 3 | Number taking test 4 |
| | | | 68 | 64 | 56 | 46 | 41 | 39 | 34 | Average time |
| | | | | | 6 | 6 | 12 | 4 | | Number taking test 5 |
| | | | | | 54 | 42 | 35 | 37 | | Average time |
| <i>Boys</i> | | | | | | | | | | |
| 28 | 34 | 30 | 31 | 33 | 44 | 57 | 48 | 18 | 12 | Number taking test 1 |
| 206 | 144 | 116 | 89 | 68 | 63 | 56 | 49 | 46 | 46 | Average time |
| | 19 | 29 | 23 | 27 | 28 | 41 | 36 | 20 | | Number taking test 2 |
| | 135 | 102 | 86 | 68 | 57 | 52 | 46 | 44 | | Average time |
| | | 14 | 24 | 21 | 24 | 24 | 24 | 13 | | Number taking test 3 |
| | | 88 | 80 | 73 | 57 | 46 | 41 | 49 | | Average time |
| | | | 11 | 17 | 13 | 19 | 18 | 12 | | Number taking test 4 |
| | | | 77 | 56 | 61 | 48 | 45 | 43 | | Average time |
| | | | | | 8 | 6 | 7 | 4 | | Number taking test 5 |
| | | | | | 56 | 45 | 48 | 40 | | Average time |

The two children later took the tests four times a day with few omissions, for four months. The first seventeen days the girl made a great improvement, the time required changing from 43 to 30 seconds. During the fourth month the results of the tests varied little. This seems to point to the same fact that has been mentioned,

namely, that at first practice brings rapid improvement in speed or rapidity of movement, but that progress decreases as the limit of speed is approached.

The tests with the boy were incomplete, but the thing of greatest note was the effect of interest in his work. When that lagged, the time required for the test was correspondingly increased. For instance, the time record after a month's practice suddenly dropped from the lowest record—106 seconds to 185 seconds, which was 15 seconds higher than the initial record.

Editor's Comment.—This test seems to be a pretty good one for establishing a norm for children of each age and grade, considerable variations from which would indicate the possession of exceptional characteristics in general. This was particularly true for younger children, the backward ones always being slow in this exercise.

As in all other tests, however, special practice quickly makes greater changes than years of development and general practice in perception and movement. This accounts also for the fact that the greatest improvement is from the first to second grade where the children are becoming familiar with numbers and with the manipulation of a pencil.

It is interesting to note that we have here indications that the first repetitions have more effect than later ones even when they are a year apart.

It is also interesting to note in this and several other studies of this series that figures based on changes in the same children from year to year are of the same general character at different periods as those that have been inferred from determining the difference between different children of all ages. The agreement is not, however, complete and the figures based on the changes in the same children at different ages are undoubtedly the more significant when the data are reliable, a few cases being equal in significance to many upon the usual basis.

THESIS IV

THE DEVELOPMENT OF THE ARTISTIC SENSE

BY GRACE L. SEAVER

Editor's Explanation.—Data for the study of individual progress in this and the two following theses were secured by taking samples of the children's best work twice a year about a month after school began and a month before it closed. These specimens were deposited in a pasteboard box upon which was the individual child's name. The children knew of these boxes and tried to have as good a specimen of their work as possible to put in them. The covers or portfolios were made by folding a piece of drawing paper to enclose the other work. The pupil placed on the outside of this portfolio his name, grade, the date and whatever decorations he chose. The "designs" on these portfolios constituted the data upon which this study of drawing and artistic development was made.

Thesis.—There is, in the school where these drawings were done, a system by means of which a sample of each child's work in all the departments is placed semi-annually in portfolios which the children make for this purpose. Thus in many cases it is possible to study the cover designs drawn by an individual child at the age of six, six and a half, seven, seven and a half, and so on until he is thirteen or fourteen years of age. In many cases the series were, through various causes, incomplete, but after eliminating those not worth considering, there were left the portfolios of one hundred and thirteen children, fifty-three boys and sixty girls. From these drawings and designs it has been possible to extract some general and particular truths regarding the development of the artistic sense of the child.

It must be understood that in this work the children had no help or suggestions from the teacher, and relied wholly upon their own ingenuity in decorating the covers of their portfolios. They also had perfect freedom in their choice of materials and models for their designs.

A description of a few of these portfolios may help to give a better idea of the problem of development in drawing as it was presented to me.

The first cover I examined had at the top a border of squares colored with red and blue crayons. The next had lines across the

corners, forming triangles which were filled in with the bright red crayon. Still another had an inch border of bright orange on all four sides of the paper. This I found to be a typical form of decoration, especially with flat washes of paint. The colors were in many cases very crude and combined without any regard to harmony.

Sometimes a portfolio would be completely covered with scrolls, flowers, etc., with no attempt at design. One had a fanciful border of stars. Many had the word "Portfolio" at the top, the child's name at the bottom and some drawing in the middle of the page. I found the following things represented: a bunch of grapes, birds of various kinds, a foot-ball, flags, blackboard with arithmetic examples, a squash, a pine-tree, pictures which illustrated stories and other equally diverse objects.

These drawings were studied from a three-fold standpoint, (I.) that of color, (II.) design or form, (III.) arrangement and general artistic effect.

Regarding color, the generalizations were based upon data as to brilliancy, particular tone used, combinations of color, and choice of neutral tints through the medium of ink, pencil or brush. Under form there were four typical divisions, objects from nature, geometric forms, those associated with some activity or recent experience, and printing or lettering.

The last set of statistics in regard to arrangement were put on the basis of comparative rank or degree of excellence. The letters A, B and C stand respectively for good, fair and poor, A meaning good, and C poor.

I first made a list of the names of all the children. The space after each name contained divisions for all the half-years between the ages of six and thirteen, inclusive. In each division I noted the color, design and rank of the child's drawing for that particular month (the tests being taken every June and October.) This made it easy to obtain the averages for the whole, and also to make studies of the development of individual children.

I

With both boys and girls a marked preference for bright colors is shown in the lower grades, which decreases steadily as the child becomes older.

It is noticeable that with the boys the use of bright colors remains at about the same per cent. until October of the ninth year. (It should be stated, perhaps, that in obtaining these per cents, five tenths of a number, or over five tenths, was reckoned as an additional per cent.) The work of the previous June showed that over

one half the colors used by the boys were bright, that is, not grayed or softened in any way, while in October of the same year only three tenths of the colors were bright.

A corresponding decrease in the per cent. of girls who made use of bright colors, also appeared in the ninth year. The decrease for the nine-year-old girls from June to October was twelve per cent., while for the boys of the same age there was a decrease of twenty per cent., in the use of bright colors.

About the same number of colors was used by both sexes, but the girls chose more as they grew older, while the boys used more in the four earlier years. This confirms the theory that the attention of girls is drawn more to color as they begin to think of matters of dress, while as the boys grew older they left the color for pen and ink work and printing.

Up to October of the ninth year, the data, for all the half-years showed that in every case more girls used bright colors than hues. Commencing with that October, however, the reverse was true for all the following half-years. More girls grayed their colors, using tints and shades, and securing more artistic effects. This was not true of the boys, for only in the eleventh and thirteenth years, did the majority of the boys use grayed tones rather than brilliant colors.

As to particular colors used, both boys and girls seemed to prefer red and green, using these colors not only for flowers, autumn leaves, and sprays of berries, but also in their original drawings. Blue came third in the list of those most used by the boys, then yellow and orange, while violet was the least popular.

The colors chosen by the girls, in order of preference, are as follows: green, red, yellow, blue, violet and orange.

For the boys, the highest per cent. for the choice of red came in the ninth year, for green in the seventh and eighth, for blue in the eighth, while the six-year-olds showed the highest per cent. for violet. As this last-named color was so little used by the children, I did not attribute the choice of it by those in the first grade to any particular liking for that color. Probably the high average was rather due to the promiscuous use of all the colors in their crayon boxes, as most of the children were not satisfied unless they used them all. The change which is brought about in this direction as the child progressed through the grades, is clearly shown by a study of the development of individuals.

In the lowest grades the girls used red, green and violet more frequently than any other colors. As they grew older, blue came to be a favorite, then yellow, and finally, in the twelfth year, orange took the lead.

As the portfolios were made twice a year, it was possible to note the development from October to June, and also the effect of the summer vacation upon the child's ability to draw.

In June more bright colors and more hues were used by the children of all grades than in October.

In all cases the neutrals were more often found in the fall portfolios than in those made in the spring. A possible explanation of this might be that after vacation the children do not have as many ideas of designs to be worked out in color. After having used crayons and paints more or less during the year they are more ready to apply color to their cover designs in June. At the ages of twelve and thirteen, where the pupils had more decided preferences and could remember better how they had used their materials, they did more color work in October than they did in June.

The per cents for the use of neutrals (ink, gray, black and white, etc.) increase at a fairly uniform rate, until, in the thirteenth year, seventy-five per cent. of all the colors used by both sexes are neutral tints. This is partly explained by the fact that in the higher grades the children turned much more to the use of lettering. They seemed to develop a sense of the fitness of things, and decorated their covers with appropriate designs, and with printing, instead of the various objects which were characteristic of their earlier years.

With the boys, the use of neutral mediums had been steadily increasing up to the ninth year, but then, in October, the average showed a jump of from thirty-five to fifty-six per cent. The per cents then continued to increase until, at the age of thirteen, we find all the boys using these materials in preference to color.

Girls, as well as boys, selected neutral mediums in the upper grades, though as has been stated, the girls still clung to the use of color, while the boys dropped it somewhat as they grew older.

II

Regarding the objects represented in the decoration of the portfolios, the curves for both sexes showed, as the child progressed through the grades, a decided increase in the use of models from nature. In studying the statistics I found that the October of the ninth year, which was mentioned before, marked a drop in the per cent. of nature forms drawn by the boys. It might be inferred that this caused the decrease in the use of brilliant colors. After the drop the average per cent. remained about the same in both cases, never returning to the higher figure. The girls also used nature forms less after they reached the ninth year. There was, perhaps, a little higher average for the use of nature specimens in June than in October.

Geometric forms, such as squares, circles and triangles, appeared in nearly half of the boys' portfolios in the two lowest grades, while in the eighth grade, none were used. This choice in the first years of school-life was probably due to the daily use of cardboard forms for "busy work."

In general, not as many girls as boys made use of the circles, squares and other precise forms, but the per cent. of those who did use them decreased at about the same rate for both sexes. One of the girls' papers showed a pretty arrangement of diamonds and circles in a border effect.

Decorations and designs made up from drawings of things associated with the child's life and work were a study in themselves. They varied in the different grades from houses and steam-engines in the lower, to Greek frets and lotus-flower borders, in the higher classes. This style of design gives more scope for originality, and I found that the children took the associated objects to draw from more as they grew older, until at the age of thirteen nearly half the boys and a correspondingly large per cent. of the girls chose this method of decoration. Through all the grades, the girls drew more associated objects than did the boys.

The October designs showed more of this kind of work. Sometimes they were related to activities of the summer, such as games, boating, seashore amusements and the like. In June I noticed flags, wreaths and other decorations connected with Memorial Day. But even this tendency did not bring the average for associated objects up as high as it was in October.

For the boys, the highest per cents for the lettering were in June of the eleventh and thirteenth years, but in October of the eleventh year there was a decrease of nearly forty per cent., and in October of the thirteenth year there was a decrease of thirty-four per cent. In fact, the curve for the lettering was very irregular.

The girl's portfolios for the last two years showed that very many of them selected lettering in preference to any other form of decoration. Indeed, in the thirteenth year three fourths of all the children printed on their covers. One was very neatly done in a beautiful tone of brown, with a fine line of bright orange around the letters in the words "Portfolio of My Best Work." Below were painted two books and at the very bottom the girl's initials in a monogram.

III

The rank for both boys and girls grew steadily higher till at the age of thirteen very few were marked C. The choice of materials and subjects probably had some effect upon the rank, as most of

the printing was excellent, while the flowers so often drawn on the covers by the lower grade pupils were not in many cases deserving of any higher mark than C.

However, the average rank did not increase in excellence as regularly as one would expect from the growing power of drawing which proper training in the grades should bring. I attributed this variation in rank somewhat to a fact which was corroborated by the individual studies, namely, that each half-year many of the children attempted something new which was as hard for them as that which they had done the year before. If at every test they had tried the same thing, doubtless the rank would have been bettered accordingly.

One thing is to be noted in the per cents of those whose covers ranked excellent. In every case, with the exception of the six-year-olds, the per cent. of boys marked A was higher in June than in either the previous or the following October. For the girls, the per cent. marked A was higher in the fall for four different years. This uniform change in rank from spring to fall would seem to indicate an increase of ability during the school year and a loss of it during the summer. Taken all together the boys received better marks than the girls.

One significant fact was noticeable throughout the work. Both sexes show much greater similarity of choice in the earlier years than they do later on in their school-life. In the higher grades the individuality becomes more marked, and there is a greater diversity of selection.

Another fact is perhaps worthy of notice. The age of nine, for both sexes, marks a change in the per cents in several particulars. This may be due to the subjects included in the drawing-course at this time, or may be due to the natural development of the child at this period.

Some of the general truths brought out by a study of these covers might be applied to the teaching of drawing in the grades.

Interest is an important factor in drawing. Many principles which are sometimes taught in abstract ways, could be made more instructive if presented in connection with things associated with the child's life and pastimes.

Children have a natural love for bright colors, but during the early years a child needs training in color perception, more especially regarding combinations of color; they may also be led to prefer the softer tones to the very brilliant colors.

They should be given only one or two colors, to use at one time, thus avoiding poor combinations. The use and effectiveness of neu-

trials may be taught early by giving the pupil one bright color to be combined with black, white or gray.

Pupils in the higher grades should be led to an appreciation of the possibilities of color, and encouraged to choose this medium for original work, as well as the pen and ink or pencil. The printing

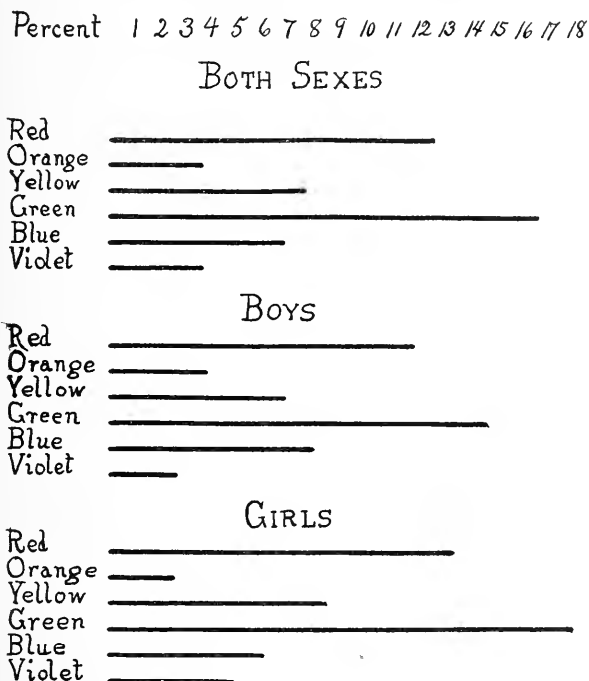


FIG. 4. Line Chart showing Per Cent. of Various Colors used in all the Designs taken together.

may be made very effective in color and with training the child may learn to delight in its use.

Little children may learn how to make border and surface designs by the use of common everyday forms. This later shows its influence and effect on the space divisions and rhythms of the original designs taken up in the higher grades.

A review in September of the principles of drawing taught the year before is necessary as the children do poorer work and apply their knowledge to less advantage in October than in June.

TABLE V
COLORS AND DESIGNS ON PORTRAIOS

| Age in Years Time of Test | | Data. Girls | | | | | | | | | | | | | | | | | |
|-------------------------------|--|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------|------------|-----------|
| | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | | |
| Total number of girls, | | June 17 | Oct. 27 | June 40 | Oct. 40 | June 45 | Oct. 45 | June 51 | Oct. 51 | June 48 | Oct. 46 | June 42 | Oct. 32 | June 27 | Oct. 19 | June 10 | Oct. 8 | June 13 | Oct. 7 |
| Colors | | | | | | | | | | | | | | | | | | | |
| Total number of colors used, | | 34 | 45 | 67 | 69 | 84 | 66 | 66 | 74 | 57 | 44 | 35 | 31 | 19 | 17 | 8 | 8 | | |
| Number bright colors, | | 23 | 26 | 40 | 39 | 47 | 24 | 27 | 14 | 14 | 9 | 7 | 2 | 0 | 0 | 1 | 2 | | |
| Per cent., | | 68 | 58 | 60 | 57 | 56 | 36 | 41 | 19 | 25 | 20 | 20 | 7 | | | 13 | 25 | | |
| Number of hues, | | 5 | 9 | 17 | 21 | 25 | 14 | 18 | 27 | 20 | 12 | 18 | 6 | 1 | 4 | 0 | 0 | | |
| Per cent., | | 15 | 20 | 25 | 30 | 30 | 21 | 27 | 36 | 35 | 27 | 51 | 19 | 5 | 24 | | | | |
| Number neutrals, | | 6 | 10 | 10 | 9 | 12 | 28 | 21 | 33 | 23 | 23 | 10 | 23 | 18 | 13 | 7 | 6 | | |
| Per cent., | | 18 | 22 | 15 | 13 | 14 | 42 | 32 | 45 | 40 | 52 | 28 | 74 | 95 | 76 | 88 | 75 | | |
| Objects | | | | | | | | | | | | | | | | | | | |
| Total number of objects used, | | 17 | 27 | 40 | 40 | 45 | 45 | 51 | 48 | 46 | 42 | 32 | 27 | 19 | 10 | 8 | 7 | | |
| From nature, | | 9 | 13 | 25 | 21 | 16 | 14 | 20 | 16 | 10 | 7 | 13 | 7 | 2 | 2 | 1 | 0 | | |
| Per cent., | | 53 | 48 | 63 | 53 | 36 | 31 | 39 | 33 | 22 | 17 | 41 | 26 | 11 | 20 | 13 | | | |
| Geometric forms, | | 6 | 9 | 5 | 4 | 10 | 3 | 9 | 4 | 3 | 1 | 1 | 1 | 3 | 0 | 0 | 0 | | |
| Per cent., | | 35 | 33 | 13 | 10 | 22 | 7 | 18 | 8 | 7 | 2 | 3 | 4 | 16 | | | | | |
| Associated, | | 1 | 5 | 5 | 9 | 9 | 12 | 9 | 13 | 17 | 13 | 9 | 14 | 3 | 3 | 1 | 2 | | |
| Per cent., | | 6 | 19 | 13 | 23 | 20 | 27 | 18 | 27 | 37 | 31 | 28 | 52 | 16 | 30 | 13 | 28 | | |
| Lettering, | | 1 | 0 | 5 | 6 | 10 | 16 | 13 | 15 | 16 | 21 | 9 | 5 | 11 | 5 | 6 | 5 | | |
| Per cent., | | 6 | | 13 | 15 | 22 | 36 | 25 | 31 | 35 | 50 | 28 | 19 | 58 | 50 | 75 | 71 | | |
| Rank | | | | | | | | | | | | | | | | | | | |
| Number ranked A, | | 2 | 4 | 12 | 6 | 13 | 5 | 12 | 15 | 20 | 20 | 19 | 14 | 15 | 3 | 7 | 7 | | |
| Per cent. ranked A, | | 12 | 15 | 30 | 15 | 29 | 11 | 24 | 31 | 43 | 48 | 59 | 52 | 79 | 30 | 88 | 100 | | |
| Number ranked B, | | 7 | 9 | 9 | 5 | 11 | 15 | 27 | 13 | 9 | 9 | 6 | 9 | 2 | 4 | 1 | 0 | | |
| Per cent. ranked B, | | 41 | 33 | 23 | 13 | 24 | 33 | 53 | 27 | 20 | 21 | 19 | 33 | 11 | 40 | 13 | | | |
| Number ranked C, | | 8 | 14 | 19 | 29 | 21 | 25 | 12 | 20 | 17 | 13 | 7 | 4 | 2 | 3 | 0 | 0 | | |
| Per cent. ranked C, | | 47 | 51 | 48 | 73 | 47 | 56 | 24 | 42 | 37 | 31 | 22 | 15 | 11 | 30 | | | | |

TABLE VI

COLORS AND DESIGNS ON PORTFOLIOS

| | Age in Years | | Time of Test | | Data. Boys | | | | | | | | | | | |
|-------------------------------|--------------|------|--------------|------|------------|------|------|------|------|------|------|------|------|------|------|------|
| | June | Oct. | June | Oct. | June | Oct. | June | Oct. | June | Oct. | June | Oct. | June | Oct. | June | Oct. |
| Total number of boys, | 7 | 13 | 29 | 28 | 37 | 40 | 41 | 42 | 43 | 35 | 33 | 31 | 21 | 16 | 13 | 7 |
| Total number of colors used, | 13 | 24 | 60 | 63 | 69 | 57 | 57 | 55 | 57 | 52 | 34 | 34 | 22 | 19 | 13 | 8 |
| Number bright colors, | 8 | 15 | 42 | 39 | 40 | 33 | 30 | 18 | 19 | 12 | 4 | 2 | 2 | 5 | 0 | 0 |
| Per cent., | 62 | 63 | 70 | 62 | 58 | 58 | 53 | 33 | 33 | 23 | 12 | 6 | 9 | 26 | | |
| Number of hues, | 5 | 5 | 7 | 9 | 20 | 6 | 7 | 6 | 7 | 4 | 11 | 6 | 1 | 1 | 0 | 2 |
| Per cent., | 38 | 21 | 12 | 14 | 29 | 11 | 12 | 11 | 12 | 8 | 32 | 18 | 5 | 7 | | 25 |
| Number neutrals, | 0 | 4 | 11 | 15 | 9 | 18 | 20 | 31 | 31 | 36 | 19 | 26 | 19 | 13 | 13 | 6 |
| Per cent., | | 17 | 18 | 24 | 13 | 32 | 35 | 56 | 54 | 69 | 56 | 76 | 86 | 68 | 100 | 75 |
| Total number of objects used, | 7 | 13 | 29 | 28 | 37 | 40 | 41 | 42 | 43 | 35 | 33 | 31 | 21 | 16 | 13 | 7 |
| From nature, | 4 | 8 | 18 | 14 | 15 | 15 | 14 | 6 | 7 | 3 | 7 | 7 | 0 | 3 | 0 | 1 |
| Per cent., | 57 | 62 | 62 | 50 | 41 | 38 | 34 | 15 | 16 | 9 | 21 | 23 | | 19 | | 14 |
| Geometric forms, | 3 | 3 | 5 | 9 | 4 | 3 | 4 | 6 | 9 | 5 | 1 | 5 | 3 | 0 | 0 | 0 |
| Per cent., | 43 | 23 | 17 | 32 | 10 | 8 | 10 | 15 | 21 | 14 | 3 | 16 | 14 | | | |
| Associated, | 0 | 2 | 3 | 1 | 11 | 9 | 11 | 7 | 8 | 7 | 3 | 10 | 6 | 5 | 3 | 3 |
| Per cent., | | 15 | 10 | 4 | 30 | 23 | 26 | 17 | 19 | 20 | 9 | 32 | 29 | 31 | 23 | 43 |
| Lettering, | 0 | 0 | 3 | 4 | 7 | 13 | 12 | 23 | 19 | 20 | 22 | 9 | 12 | 8 | 10 | 3 |
| Per cent., | | | 10 | 14 | 19 | 33 | 29 | 55 | 44 | 57 | 67 | 29 | 57 | 50 | 77 | 43 |
| Number ranked A, | 0 | 4 | 11 | 5 | 9 | 8 | 12 | 10 | 22 | 17 | 20 | 16 | 15 | 10 | 13 | 6 |
| Per cent. ranked A, | | 31 | 38 | 18 | 24 | 20 | 29 | 24 | 51 | 47 | 61 | 52 | 71 | 63 | 100 | 86 |
| Number ranked B, | 3 | 2 | 5 | 6 | 9 | 8 | 11 | 15 | 9 | 9 | 8 | 11 | 4 | 4 | 0 | 0 |
| Per cent. ranked B, | 43 | 15 | 17 | 21 | 24 | 20 | 26 | 36 | 21 | 27 | 24 | 35 | 19 | 25 | | |
| Number ranked C, | 4 | 7 | 13 | 17 | 19 | 24 | 18 | 17 | 12 | 9 | 5 | 4 | 2 | 2 | 0 | 1 |
| Per cent. ranked C, | 57 | 54 | 45 | 61 | 51 | 60 | 44 | 40 | 28 | 27 | 15 | 13 | 10 | 13 | | 14 |

Rank

Editor's Comment.—The discussion of the above data is so complete and clear that further explanation is unnecessary. It is worth while, however, to emphasize the value of such data of which as yet little has been collected or published. The children being entirely free from the constraint of authority, but with a motive to do their best, chose and executed according to their own ideas, as influenced of course by training, special events, and the example of companions. Since the tables are based largely upon the work of the same children from year to year they are good indications of the way in which the artistic sense and ability develop in individual children under the influences to which those children were subjected. The development of a science of education would be greatly helped by giving pupils an opportunity and motive to freely do work according to their own ideas in the various lines of school work, and preserving such work year after year as data for determining just how children do develop in interest and effective power under the influence of a given school system and the social conditions of the locality. Boxes for the preservation and alphabetical filing of such records can be made at an expense of not over five dollars per hundred, and if the school population is stable, the labor of filing the papers is not excessive. In our own schools the labor of keeping the files was great in proportion to the number of complete papers obtained, because pupils frequently changed from our district to other parts of the city. If such records were kept, there are plenty of specialists who would be glad to work up the data.

THESIS V

DEVELOPMENT OF PENMANSHIP

BY GRACE EMOGENE STOCKWELL

Thesis.—My interest in this study lies in the importance of legible writing as a means of expression. My aim is to find the changes that occur from year to year during school life.

Through the statistics and facts I have gained I hope to present the changes that occur, both general and individual, and yearly and half yearly. In gathering these records, I had an excellent opportunity, for the children of the Edgerly school select specimens of their best work which they would like to have preserved, each October, one month after school has begun, and each June—one month before school closes. Thus in many cases, there are complete sets of each child's writing selected at half yearly periods from the second through the eighth grades.

I classified the writing of the pupils as to general appearance, slant regularity, neatness, and individual letters, grading them as excellent, good, poor or very poor.

In all there were ninety-eight sets of which the greater number were complete from October, 1902, to October, 1906, thus giving four June records and four October records. A few were incomplete because the child was absent at the time of selection; others because the child did not enter at the lowest grade or left before he reached the higher grades.

The statistics gathered from these records are reasonably accurate. The fact that the records were not of special writing lessons but of language or spelling work, and that the child himself chose what he considered a specimen of his best work, makes them of special value.

It must be taken into consideration that the work was done under conditions impossible to render exactly similar, and this is the cause of any slight inaccuracy that may appear in the records.

A great deal depends upon the teacher, the special teacher for each different year undoubtedly caused a difference in the strength of the motive to do good work.

The first comparison was made of the records from October to June embracing the period of time spent by the children in the school.

The results show that in general appearance and regularity, the

TABLE VII
CHANGES IN WRITING. GENERAL COMPARISONS

| | Oct. to June | | | June to Oct. | | | Oct. to Oct. | | | June to June | | |
|----------------------|--------------|------|-----------------|--------------|------|------|--------------|------|------|--------------|------|------|
| | Improved | Same | Lost | Improved | Same | Lost | Improved | Same | Lost | Improved | Same | Lost |
| General appearance { | | | | | | | | | | | | |
| Number | 145 | 133 | 31 | 63 | 137 | 45 | 107 | 106 | 26 | 99 | 91 | 30 |
| Per cent. | 46 | 43 | 10 | 25 | 55 | 18 | 45 | 43 | 10 | 45 | 41 | 13 |
| Slant { | | | | | | | | | | | | |
| Number | 90 | 167 | 52 | 49 | 153 | 43 | 85 | 105 | 51 | 81 | 108 | 31 |
| Per cent. | 29 | 54 | 17 | 20 | 62 | 17 | 35 | 43 | 21 | 36 | 49 | 14 |
| Regularity { | | | | | | | | | | | | |
| Number | 150 | 123 | 36 _a | 66 | 125 | 54 | 105 | 98 | 38 | 105 | 86 | 34 |
| Per cent. | 48 | 39 | 11 | 26 | 50 | 22 | 43 | 40 | 15 | 45 | 39 | 15 |
| Neatness { | | | | | | | | | | | | |
| Number | 131 | 143 | 35 | 69 | 119 | 57 | 109 | 96 | 36 | 85 | 111 | 24 |
| Per cent. | 42 | 46 | 11 | 28 | 48 | 23 | 45 | 39 | 14 | 38 | 50 | 10 |
| Individual letters { | | | | | | | | | | | | |
| Number | 116 | 152 | 41 | 63 | 134 | 48 | 101 | 103 | 37 | 92 | 93 | 35 |
| Per cent. | 37 | 49 | 13 | 25 | 54 | 19 | 41 | 42 | 15 | 41 | 42 | 15 |

greatest number improve, a second class remain the same, while a very few lose. In the slant of the writing much the greatest number retain the same slant, about one half of the rest improve, that is, bring the slope of their letters nearer a recognized form, while nearly as many lose, that is, fall away from the standard slope, sometimes sloping their letters both right and left. In neatness and formation of individual letters, the greatest number remained the same, nearly as many improved, while a few lost.

The next comparison was from June to October, the period of time spent mostly in summer vacation.

These results show that in every respect, in general appearance, slant, regularity, neatness, and individual letters, there is a standstill, more than one half remaining the same, while of the rest few more gain than lose.

I then made yearly comparisons from October to October and June to June. In the October to October comparisons, it must be noted that the children received their practice in writing before the summer vacation and that the specimens of writing were obtained after the summer vacation.

In general appearance the greatest number improved, a close second remained the same, a very few lost.

In slant the greatest number remained the same, nearly as many improved, a few lost.

In regularity the greatest number improved, nearly as many remained the same, a few lost.

In neatness a large proportion improved, nearly as many remained the same, a very few lost.

As to individual letters nearly equal numbers improved and remained the same, a few lost.

The next comparison was of the June to June records. In this case the summer vacation came before the practice and the specimens of writing were selected after a year of work.

This time in general appearance and regularity the greatest number improved, those who remained the same came a close second and a few lost.

In slant and neatness the greatest number remained the same, nearly as many improved and a few lost.

In individual letters nearly equal numbers improved and remained the same and a few lost.

I then made individual comparisons from year to year, classing the girls and boys separately. These comparisons noted whether the writer remained constant or lost and the age at which he remained constant or lost.

TABLE VIII
CHANGES IN WRITING
GIRLS' INDIVIDUAL YEARLY COMPARISONS

| | | <i>Constant</i> | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|-----------------|----|----|----|----|----|----|-----|----|-----|----|-----|----|-----|----|--|--|--|
| Age | | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 | | | |
| Number of comparisons | | 8 | 22 | 40 | 65 | 78 | 88 | 84 | 80 | 79 | 51 | 41 | 29 | 24 | 10 | 8 | | | |
| General appearance | { Number | | | 1 | 1 | 2 | 6 | 10 | 9 | 11 | 14 | 16 | 9 | 5 | 1 | 1 | | | |
| | { Per cent. | | | 4 | 2 | 3 | 7 | 11 | 10 | 13 | 17 | 31 | 21 | 17 | 4 | 10 | | | |
| Slant | { Number | | | | | 3 | 3 | 10 | 14 | 15 | 7 | 6 | 5 | 5 | 2 | 1 | | | |
| | { Per cent. | | | | | 4 | 3 | 11 | 16 | 18 | 8 | 11 | 12 | 17 | 8 | 10 | | | |
| Regularity | { Number | | | 1 | 1 | 2 | 8 | 6 | 12 | 13 | 11 | 14 | 7 | 6 | 2 | 1 | | | |
| | { Per cent. | | | 4 | 2 | 3 | 10 | 6 | 14 | 16 | 13 | 27 | 17 | 20 | 8 | 10 | | | |
| Neatness | { Number | | | | | 2 | 3 | 4 | 2 | 9 | 13 | 16 | 15 | 6 | 5 | 1 | | | |
| | { Per cent. | | | | | 5 | 4 | 5 | 2 | 10 | 16 | 20 | 29 | 39 | 17 | 20 | | | |
| Individual letters | { Number | 1 | 1 | 3 | 3 | 6 | 4 | 12 | 10 | 15 | 16 | 10 | 4 | | 1 | | | | |
| | { Per cent. | 12 | 4 | 7 | 4 | 7 | 4 | 14 | 12 | 19 | 31 | 24 | 13 | | 10 | | | | |

| | | <i>Negative</i> | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|-----------------|----|----|----|----|----|----|-----|----|-----|----|-----|----|-----|----|--|--|--|
| Age | | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 | | | |
| Number of comparisons | | 8 | 22 | 40 | 65 | 78 | 88 | 84 | 80 | 79 | 51 | 41 | 29 | 24 | 10 | 8 | | | |
| General appearance | { Number | | | | 2 | 2 | | | 1 | 1 | 5 | 5 | 2 | 2 | 1 | | | | |
| | { Per cent. | | | | 5 | 3 | | | 1 | 1 | 6 | 9 | 4 | 6 | 4 | | | | |
| Slant | { Number | | | 1 | 1 | 3 | 14 | 11 | 10 | 12 | 14 | 7 | 4 | 3 | 1 | | | | |
| | { Per cent. | | | 4 | 2 | 4 | 17 | 12 | 11 | 15 | 17 | 13 | 9 | 10 | 4 | | | | |
| Regularity | { Number | | | | 1 | 1 | 2 | 4 | 2 | 1 | 8 | 6 | 2 | 3 | 1 | | | | |
| | { Per cent. | | | | 2 | 1 | 2 | 4 | 2 | 1 | 10 | 11 | 4 | 10 | 4 | | | | |
| Neatness | { Number | | | | | 2 | 1 | 2 | 5 | 1 | 5 | 3 | | 1 | | | | | |
| | { Per cent. | | | | | 3 | 1 | 2 | 5 | 1 | 6 | 5 | | 3 | | | | | |
| Individual letters | { Number | | | | | 1 | 1 | 4 | 2 | 1 | 3 | 7 | 4 | 1 | | | | | |
| | { Per cent. | | | | | 1 | 1 | 4 | 2 | 1 | 3 | 13 | 9 | 3 | | | | | |

In the girls' comparisons I found the following results: First, those who remained constant. In general appearance of the writing the greatest per cent. remained constant at eleven and one half years. The standstill began at nine and one half and lasted until twelve and one half.

In slant the highest per cent. remained constant at twelve years. The standstill began at nine and one half years and lasted until twelve and one half.

In regularity the greatest per cent. came to a standstill at eleven and one half years. The standstill began at ten and lasted until twelve and one half.

In neatness the standstill began at ten and lasted until twelve and one half while the highest per cent. came at the age of twelve.

So it can be seen that in general, in the case of the girls, the majority stop their development of writing at about nine and one

TABLE IX
CHANGES IN WRITING
BOYS' INDIVIDUAL YEARLY COMPARISONS

| | | <i>Constant</i> | | | | | | | | | | | | | | | |
|-----------------------|-------------|-----------------|----|----|----|----|----|----|----|-----|----|-----|----|-----|----|-----|----|
| | | Age | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 |
| Number of comparisons | | | 8 | 22 | 40 | 65 | 78 | 88 | 84 | 80 | 79 | 51 | 41 | 29 | 24 | 10 | 8 |
| General appearance | { Number | | 1 | 1 | 1 | 6 | 10 | 6 | 9 | 11 | 10 | 9 | 7 | 9 | 7 | 3 | |
| | { Per cent. | | 12 | 4 | 2 | 9 | 12 | 6 | 10 | 13 | 12 | 17 | 17 | 31 | 29 | 30 | |
| Slant | { Number | | | | 2 | 4 | 7 | 10 | 9 | 13 | 5 | 5 | 11 | 6 | 8 | 3 | 5 |
| | { Per cent. | | | | 5 | 6 | 8 | 11 | 10 | 16 | 6 | 9 | 26 | 20 | 33 | 30 | 62 |
| Regularity | { Number | | 2 | 2 | | 6 | 10 | 6 | 10 | 7 | 7 | 6 | 6 | 6 | 3 | 4 | |
| | { Per cent. | | 25 | 9 | | 9 | 12 | 6 | 11 | 8 | 8 | 11 | 14 | 20 | 12 | 40 | |
| Neatness | { Number | | 1 | | 3 | 6 | 7 | 11 | 14 | 11 | 9 | 13 | 10 | 5 | 3 | | |
| | { Per cent. | | 4 | | 4 | 7 | 7 | 13 | 17 | 13 | 12 | 31 | 30 | 20 | 30 | | |
| Individual letters | { Number | | 2 | 2 | 1 | 6 | 10 | 6 | 9 | 10 | 13 | 6 | 9 | 5 | 3 | 4 | 1 |
| | { Per cent. | | 25 | 9 | 2 | 9 | 12 | 6 | 10 | 12 | 16 | 11 | 21 | 17 | 12 | 40 | 12 |

| | | <i>Negative</i> | | | | | | | | | | | | | | | |
|-----------------------|-------------|-----------------|----|----|----|----|----|----|----|-----|----|-----|----|-----|----|-----|----|
| | | Age | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 12½ | 13 | 13½ | 14 |
| Number of comparisons | | | 8 | 22 | 40 | 65 | 78 | 88 | 84 | 80 | 79 | 51 | 41 | 29 | 24 | 10 | 8 |
| General appearance | { Number | | | | 1 | | 1 | 2 | 1 | 4 | 6 | 1 | 6 | 2 | 3 | 1 | |
| | { Per cent. | | | | 2 | | 1 | 2 | 1 | 5 | 7 | 1 | 14 | 6 | 12 | 10 | |
| Slant | { Number | | 1 | 2 | 2 | 5 | 8 | 9 | 9 | 7 | 4 | 6 | 4 | 4 | 1 | 1 | |
| | { Per cent. | | 12 | 9 | 5 | 7 | 10 | 10 | 10 | 16 | 5 | 11 | 9 | 13 | 4 | 10 | |
| Regularity | { Number | | | | 1 | | 3 | 5 | 4 | 5 | 7 | 2 | 2 | 5 | 3 | | |
| | { Per cent. | | | | 2 | | 3 | 5 | 4 | 6 | 8 | 3 | 4 | 17 | 12 | | |
| Neatness | { Number | | 1 | 1 | | 2 | 5 | 4 | 4 | 3 | 5 | 1 | 4 | 4 | | | |
| | { Per cent. | | 4 | 2 | | 2 | 5 | 4 | 5 | 3 | 9 | 2 | 3 | 16 | | | |
| Individual letters | { Number | | | | 1 | | 1 | 4 | 3 | 3 | 4 | 4 | 2 | 3 | 4 | 2 | |
| | { Per cent. | | | | 2 | | 1 | 4 | 3 | 3 | 5 | 7 | 4 | 10 | 16 | 20 | |

half years of age; the number of those who stop developing gradually increasing until the ages of eleven and one half and twelve when the per cent. is largest, then decreasing in number until the standstill is virtually ended at twelve and one half or thirteen.

For those girls who lost, the highest per cents came at these ages—in general appearance at eleven and one half, the losses coming between eight and twelve and one half; in slant—at nine and eleven, the losses coming between nine and twelve and one half; in regularity at eleven and one half, the losses coming between eleven and twelve and one half; in neatness at eleven, the losses coming between ten and eleven and one half; in individual letters at eleven and one half, the losses coming between nine and one half and twelve.

In general the greatest per cent. of girls lost at the ages of eleven and eleven and one half, the losses coming between the ages of nine and twelve and one half.

So it can be seen that between the ages of nine and twelve and one half girls either lose or come to a standstill in the development of writing.

Comparing the boys' records with those of the girls, I find that while a large per cent. of both either lose or come to a standstill at about nine years of age, that period is ended with the girls at about twelve and one half, and improvement begins again while the boys continue longer in their standstill or losses. Moreover the per cent. of girls who lose or remain the same is much smaller than the per cent. of boys.

Probably this is due partly to the fact that girls are naturally more painstaking in their work than the average boy; also to the finer coordination in the girls' muscles than in the boys. But this subject will be taken up later.

The fact that after the age of twelve and one half the girls again show signs of improvement while the boys continue to lose or remain the same is explained in this way; as girls grow older they write well because good writing is asked for and praised while boys follow their other interests and cease in their efforts for improvement.

In order to understand fully the difficulties a child has to overcome, and the full significance of his development of this process, it is necessary to go back to fundamental principles.

Writing involves complex muscular movements. All the different factors fit each other perfectly. Children's nerve centers are far from perfectly developed, so it follows that the movements of the muscles do not cooperate perfectly, and we who have not known this have sometimes wondered why children can not seem to direct their movements in writing.

Writing must be developed by trial after trial with the mind concentrated upon the result obtained and not upon the movement itself.

It should be realized that the development of coordinated movements is the important point in teaching a child to write, and not merely some particular method.

At first the child's movement is not easy. His attention is not free for he has to study the form of the letters. His movements are cramped and jerky and lack organization. This irregularity refers back to lack of organization in the brain.

That a regular coordinated movement of the muscles is necessary for good writing is shown by the fact that after the summer vacation, during which these movements have ceased, there is comparatively far less improvement than after the year of work and practice. But it is wonderful that loss after vacation is not greater than it is, for the majority hold their own and more improve than lose.

We may explain this perhaps by the fact that the rest and the reereation of a vacation gives new vigor to the wearied muscles even as the lack of coordinated movements takes away from their regularity.

Editor's Comment.—Educationally these results are important in that they confirm the common opinion of teachers that after a certain age children usually cease to improve and perhaps deteriorate in their writing, and emphasize the importance of determining just why this is. In my opinion, school methods are largely, but not wholly, responsible. In the early stage of writing only are the children learning the visual forms of letters, while in the later stages they are forming motor habits. Unfortunately teachers have failed to recognize clearly these two phases of learning to write, and they have also failed to realize that a habit formed under these conditions of copy-book practice will almost surely not carry over and function under the condition of expressing thought while writing.

On the theoretical side the data are interesting as indicating what is also suggested by several other studies of this series, *i. e.*, that there is a decrease or increase in the rate of development in various forms of physiological and mental functioning correlated more or less closely with the rate of growth of boys and girls in height and weight. Perhaps, as claimed by C. W. Crampton in a recent number of the Psychological Clinic, these changes are not dependent upon growth, but like growth are indications of the degree of physiological maturity in relation to the attainment of pubescence.

THESIS VI

THE DEVELOPMENT OF LANGUAGE

BY ELIZABETH S. SMITH

The original papers upon which this study was based were not sufficiently numerous and uniform to permit the drawing of general conclusions of value regarding sentence structure, length of sentence, etc. Hence, they are not printed.

THESIS VII

CHARACTERISTICS OF CHILDREN AS VIEWED BY TEACHERS

BY MABEL JOSEPHINE SPALTER

Editor's Explanation.—This thesis is based upon reports of teachers, in training, regarding the conduct, ability, success in studies and most marked characteristics, of individual children.

Thesis.—My main thought in this thesis is to find out to what extent different teachers judge the same children in the same way, and, where a difference of opinion occurs, to what it is due.

Under conduct, I used good, fair, and poor, as the three heads under which to correlate the one hundred and eighty-three papers. There were in the majority of cases from three to six reports concerning each child, so my standard of "complete correlation" was that every teacher had judged the child in the same way; and of "incomplete correlation" that some difference in the opinion of the teachers was shown, as where, perhaps, two reports out of three agreed, or three reports out of four or five.

The reports upon "Means of Influence" were very hard to classify, owing to the many different ways in which teachers seek to influence their pupils. Praise and affection were used most frequently by teachers.

It was especially hard to classify the characteristics of children.

The most prominent characteristics noticed with the boys were "self control," "an interest in work," "a desire to learn," "restlessness," "stubbornness" and "pleasantness," while among the girls "shyness," "willingness" and "inattention" prevailed. The following are typical individual records.

B. F.

In the first grade this boy seemed shy and sneaky, proved himself untrustworthy and would not try to do well.

In the second grade he still continued to be mischievous, sly and lazy.

He is now in the third grade and still has the spirit of contrariness, but many times does little helpful things.

A. G.

This boy in the lower grades was inclined to be mischievous, needed a firm hand and could only be influenced by an interest in

his work. Now he is doing much better, by having been made an officer in the school where self government is prominent.

E. M.

This little girl in the first grade was very slow in her work, but thought herself quite smart and always wanted to be first without any effort. She was out a great deal from school because of sickness and perhaps that partially accounts for her being slow in her work.

In the second grade she was slow in her work but always wanting to be first.

Now in the third grade she is very sensitive, and easily discouraged if reprimanded for anything, however slight.

E. F.

One teacher thought this girl silly, a giggler, but earnest in her work, while the next teacher attributed her silliness to nervousness.

M. M.

In the lower grades this girl was thought to be very lazy and idle but in the fifth grade the teacher reported her as learning very easily but lacking persistence which perhaps accounts for her seeming idleness.

L. H.

This boy was very silly and giggled incessantly. One teacher reported that this giggling had ceased but the next teacher thought environment had caused the laughter, for the lad suddenly showed a natural ability which had lain dormant and was on the alert, showing great improvement in all his work.

It would seem from these statements that the teachers appealed to different qualities which called forth various actions and responses from the children.

I compared the work of nine children who had complete correlation and three with whom there was no correlation in different subjects.

In composition work I found that only one of the nine showed a decrease in the standing of her work, and of the three the standing was variable—first a decrease, then increase, and decrease again.

In the perception motor test six out of the nine, having complete correlation, did it in a shorter time each year but the remaining three were irregular—one year it took a shorter time and then perhaps the next year a longer time. From the three with whom no correla-

tion was found only one could shorten the time each year while the other two lengthened the time one year and shortened it the next.

In physical measurements one of the nine and one of the three showed uneven development.

In writing only one of the nine did not show progress—the others went from poor to either good or excellent. With the three, whose correlation was incomplete, progress was also shown.

In auditory and visual tests of memory all but one of the nine and one of the three showed an increase in ability to remember dictation.

From these papers I should say that the teachers do judge children, to a great extent, in the same way, and from the preceding reports I should think that they judge them quite correctly.

There is more complete correlation with boys than with girls.

I talked with the different supervisors about different children and found that a child with perfect physical growth showed complete correlation oftener than a child whose growth was backward or stunted.

TABLE X

CORRELATION IN THE REPORTS OF SUCCESSIVE TEACHERS OF THE SAME CHILDREN

| Grades | No. of Reports | | | | | | Complete | | More than $\frac{1}{2}$ | | Less than $\frac{2}{3}$ | | None | | Total |
|-----------------|----------------|----|----|----|----|----|----------|----|-------------------------|----|-------------------------|---|------|----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | No. | % | No. | % | No. | % | No. | % | |
| | 12 | 16 | 23 | 19 | 16 | 23 | 46 | 42 | 33 | 30 | 3 | 2 | 27 | 24 | |
| Conduct, | | | | | | | | | | | | | | | 109 |
| Influence, | | | 35 | 8 | 3 | 2 | 3 | 6 | 1 | 2 | | | 44 | 91 | 48 |
| Ability, | 18 | 21 | 22 | 20 | 28 | 3 | 34 | 33 | 33 | 25 | 3 | 2 | 42 | 38 | 112 |
| Good in what, | 13 | 23 | 14 | 7 | 2 | 10 | 22 | 32 | 13 | 18 | 2 | 3 | 32 | 46 | 69 |
| Poor in what, | | 26 | 19 | 4 | 5 | | 16 | 29 | 7 | 12 | | | 31 | 57 | 54 |
| Characteristic, | 20 | 28 | 29 | 8 | 9 | 2 | 12 | 12 | 4 | 4 | | | 80 | 83 | 96 |

| Boys | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|---|---|----|----|----|
| Conduct, | 5 | 4 | 18 | 27 | 10 | 10 | 26 | 35 | 23 | 31 | 5 | 6 | 20 | 27 | 74 |
| Influence, | | 33 | 23 | 3 | 7 | 8 | 5 | 6 | 1 | 1 | 1 | 1 | 67 | 90 | 74 |
| Ability, | 13 | 25 | 23 | 2 | 9 | 1 | 38 | 52 | 13 | 17 | 5 | 6 | 17 | 23 | 73 |
| Good in what, | 20 | 24 | 16 | 13 | 16 | 3 | 20 | 21 | 18 | 17 | | | 54 | 58 | 92 |
| Poor in what, | 29 | 20 | 6 | 12 | | | 13 | 19 | 3 | 4 | | | 51 | 77 | 67 |
| Characteristic, | 17 | 25 | 14 | 3 | 6 | 4 | 11 | 16 | 7 | 10 | 2 | 3 | 49 | 71 | 69 |

Editor's Comment.—Data of this character, consisting in part of reports by young teachers in practice, are not well suited to statistical study; but some of the individual reports are interesting and the fact that in general children about whom the reports of teachers agree are more likely to show consistency in mental and physical tests than those whose reports vary from year to year is very significant.

THESIS VIII

THE CURVE OF LEARNING

BY ABBIE F. MUNN

Editor's Explanation.—This experiment for studying habit formation was devised by Professor Lough, of New York University, who very kindly furnished the blanks for the test. (He would be glad to have others cooperate in the same test, that norms for practice curves may be established.)

TEST SHEET

1. T O P E S N I D R M H C Q L G B J K F A
2. P T K O F G A E S Q N L I D B R M H C J
3. C F L S B G A P K H M R D I N T E O J Q
4. J A N T B I Q R O L E K P S M C G D F H
5. E J O T D I N S C H M R B G Q A F K P L
6. T C E F A D K O Q J R P I G M S H I N B
7. G B M S A H N T C I O P D K Q E F L J R
8. H T I S R K Q L P M O A G B F C E N D J
9. D G J M P S A E H K O R B T F I L N Q C
10. K H O F A G M J P E B Q S R I N D L C T

KEY SHEETS

| I | II |
|-----|-----|
| A—X | A—O |
| B—U | B—I |
| C—F | C—G |
| D—L | D—N |
| E—Y | E—J |
| F—M | F—V |
| G—B | G—A |
| H—W | H—H |
| I—Z | I—D |
| J—E | J—R |
| K—R | K—E |
| L—D | L—Z |
| M—H | M—W |
| N—A | N—B |
| O—V | O—M |
| P—J | P—Y |
| Q—N | Q—L |
| R—G | R—F |
| S—I | S—U |
| T—O | T—X |

The material for the test consists of (1) a test sheet with ten

lines of letters in mixed order, and (2) a key sheet, in which the twenty letters used in the test sheet are arranged in a vertical column and opposite each is printed some other letter. The idea of the test is that the letters in the second column of the key sheet are to be substituted respectively for the corresponding letters in the first column. The procedure was as follows: Only one line of the test sheet was exposed to view at once. A blank sheet covered all the lines below the line in use at any moment, and the lines that had already been used were folded under and so concealed. The key sheet was kept in sight all of the time. Having before him the key sheet and the first line of the test sheet, the person tested, at a given signal, began writing beneath each letter of the test sheet the letter corresponding thereto in the key sheet; thus, writing X beneath each A of the test sheet, U beneath each B, etc. Having no previous acquaintance with the key sheet, the person tested had, at the beginning of the experiment, to refer continually to the key sheet in order to determine what letter to write beneath each letter of the test sheet.

As soon as one row of letters was written, the time in seconds was recorded, the edge of the sheet upon which they were written folded under, the second row of letters exposed, and the experiment continued. Each line of letters is called a "trial," and the ten lines done at one time constitute a "test." After one or more trials the subject notices that the first column on the key sheet is in alphabetical order and then knows just where to look for the required letter. After a greater or less amount of practice most of them learned also what letter was opposite each letter of the alphabetical series so that it was not necessary to look on the key sheet at all. When the learning was partly complete, a few students wasted time in trying to think what letter to write instead of looking at once on the second sheet, and thus took a longer time than when they first began; but this was not a general source of irregularity.

Directions for the experiment were given the normal school students in class and the experiments performed in their rooms. They were asked to have the conditions as nearly the same as possible and to take the time as accurately as they could with a watch. Most of them had a classmate keep the time, but a few kept it themselves. The "standard series" consisted of one test a day, at the same time of day, but several groups of students were asked to take more tests, and at different intervals, as is indicated in detail in the thesis. Tests of children were made under the immediate direction of Misses Lane and Munn.

In order to study interference effects, persons who had already

practiced with key sheet I. were required to change to key sheet II.

Thesis.—The aim of this study was to find a standard curve of learning, the variations in this curve resulting from the different methods of taking the tests; the conditions under which most progress was attained and those where least progress was made.

As a means for this investigation, I made a study of one hundred and twenty papers, from as many individuals, showing the results of a habit formation experiment. The greater part of these papers were received from normal school students, all women; some few however were obtained from children of a third, a seventh and an eighth grade.

Each individual, with a few exceptions noted below, went through a series of twenty tests, each "test," as explained above, consisting of ten lines or "trials." In different series, the tests were differently distributed in time. The individuals participating in the various practice series, mentioned below, were in all cases different individuals.

The first group comprises individuals who took one test a day for twenty successive days. This group I call my standard or regular series, and the curve of learning resulting from these papers I call the standard or regular curve of learning.

Fig. 5 represents the results of the regular series, taken by twenty-three normal school students. On this chart are five curves, A, B, C, D, E.

Curve A represents the record made during ten trials or one test; curve B the record of the second ten trials or test two; curve C shows the records of the first trials of the twenty tests; curve D the results of the tenth trials of the twenty tests; curve E the averages of the twenty tests.

Discussion of Regular Series.

Curve A shows steady gain first half, little gain last half; former gain 6.8 seconds, latter gain 2.8 seconds—entire gain 9 seconds.

Curve B. Here the gain is more even, the first and second halves of curve varying little. The entire gain was 6.2 seconds.

Curves C and D both show great gain, first half less gain toward the end. As the practice continues, the rate of progress diminishes

Curve E is the important curve of all, for it shows the average of all the tests. The total gain made during the practice was 28 seconds, the gain first half was 21 seconds, gain second half was 7 seconds. Gain first half was three times the gain of second half.

Before leaving this set of papers it may be of interest to notice one or two of the individual papers. For this study I chose the

two papers which showed the most marked contrast, one the paper of the individual who made the greatest gain, the other the paper belonging to the one whose gain was the least. Fig. 6 represents the former gains; Fig. 7 the gains of the latter.

By comparing these two curves, it is evident that the natural ability as far as quickness is concerned varied greatly. One was extremely slow at the beginning while the other was quick.

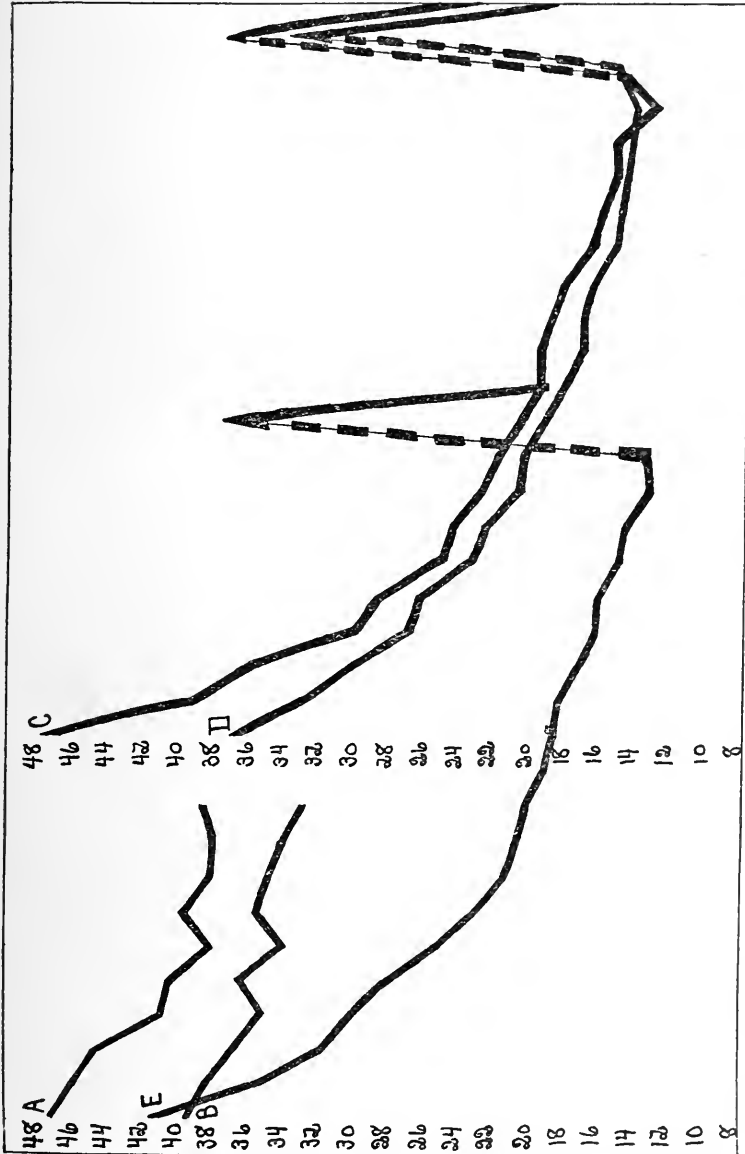


Fig. 5. "Regular Series." Twenty Trials with the A-X Key, and One with the A-O Key. Average Results of 23 Normal School Students. Curve A gives the results of the 10 successive trials composing the first "test"; curve B gives the results of the 10 successive trials composing the second test; curve C gives the results of the first trials of the 20 tests; curve D gives the results of the tenth trials of the 20 tests; curve E gives the averages of each of the 20 tests.

The subject who was the slowest in doing the tests at the beginning made more rapid and greater gains throughout the entire series than did the one whose first test was done in the least time. Fig. 6 also shows that the limit in the rate of progress had not been reached by the reagent while Fig. 7 shows the opposite to be true. The gain made by the reagent whose results are shown on Fig. 6 was 46.6 seconds,

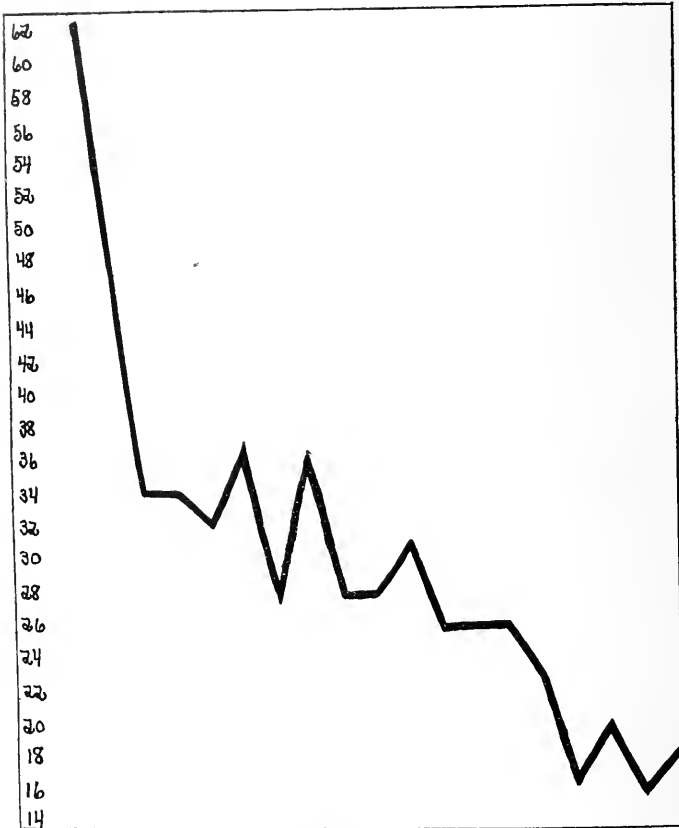


FIG. 6. Individual Making the Greatest Gain.

3.3 times as much as that made by the other reagent whose gain was 13.2.

After the first five or six trials of a test there is usually a loss of a second or two, this loss however is frequently made up by the following trial and almost without fail before the end of the test.

The longest time taken by any individual for the first trial was 90 seconds, the shortest time was 30 seconds. For the last trial the longest time was 35 seconds, the shortest was 7 seconds.

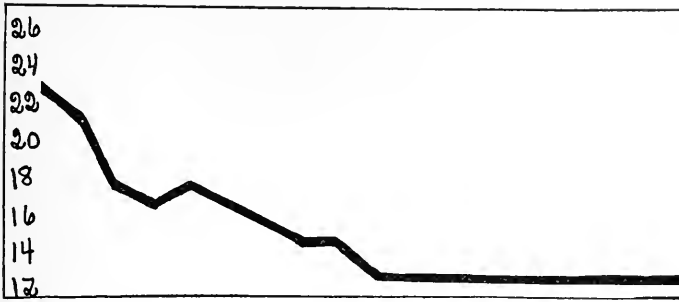


FIG. 7. Individual Making the Least Gain.

Fig. 8 represents the results of one of the special series, in which ten tests were taken one Saturday and ten on the Saturday following. These tests were taken by four normal school students.

This curve is less regular than the curves of the "regular series" shown in Fig. 5, but there are no great gains or losses, save for the one loss which is noticeable between the two periods of the exer-

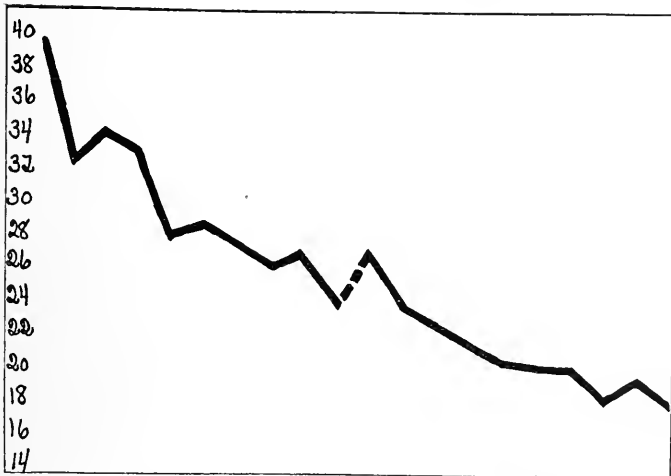


FIG. 8. Ten Tests a Day, on Two Days a Week Apart.

cise. These losses too are not permanent for by the second test after the interval they are more than reclaimed.

From these curves too we notice that the greater gains are near the beginning of the series, that as the practice continues the gains decrease. The gains made throughout all these curves are pretty uniform. The average gain made during the entire exercise was 20.7 seconds. The gain the first half was 14.4 seconds; gain last half was 6.3 seconds.

Here we find the gain made during first half of series to be twice the gain of the second half, while in the case of the regular series the gain in the first half was three times the gain in the second half.

We find that the week's interval between the two periods of practice caused a slight set-back in the rate of speed but the loss was only temporary and easily regained.

In another experiment, a series of 17 "tests"—each consisting of 10 lines of the test sheet—was executed on the same day and without intermission between the tests. This experiment was tried on 4 normal school students. The average result is shown in Fig. 9.

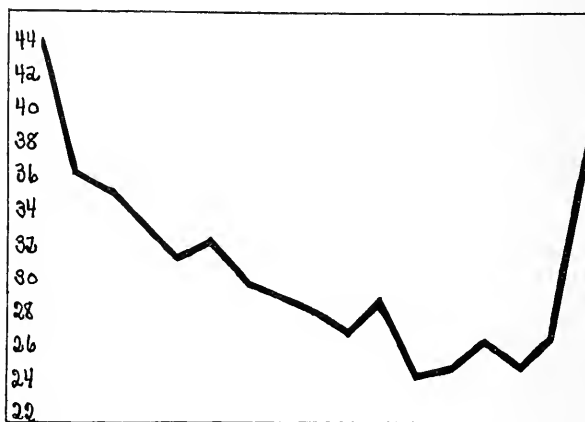


FIG. 9. Seventeen Tests Without Intermission.

On comparing this curve with that of the "regular series" in Fig. 5, we find them alike in that the gains are in both instances near the beginning of the series. They are unlike in other respects. The curves of the regular series are even and gradual, while those of the continuous practice series are much more irregular.

| | Gains, Fig. 5 | Gains, Fig. 9 |
|---------------------------|---------------|---------------|
| Entire gain | 28 | 14.4 |
| Gain in first half | 21 | 17 |
| Gain in second half | 7 | — 3 (loss) |

From the above comparisons it can readily be seen that the process of learning gradually counts for more than learning quickly; that short periods of practice in learning are more effective and beneficial than the long extended ones.

Fig. 10 shows the results of another series, in which five tests were taken at each of four different periods on the same day; there being two morning periods and two afternoon periods. Normal school students were the subjects of this experiment.

The curve indicates that four times as much gain was made during the first half of this series as in the last half. The gain of the first half was 17 seconds while that of the last was but 4 seconds, making the entire gain 21 seconds.

From the perusal of this chart one new significant point is gained, namely, that work in the morning is more effective than the afternoon work. If we apply the above to school work, it follows that the harder work of the day should be a part of the morning program, rather than of the afternoon one.

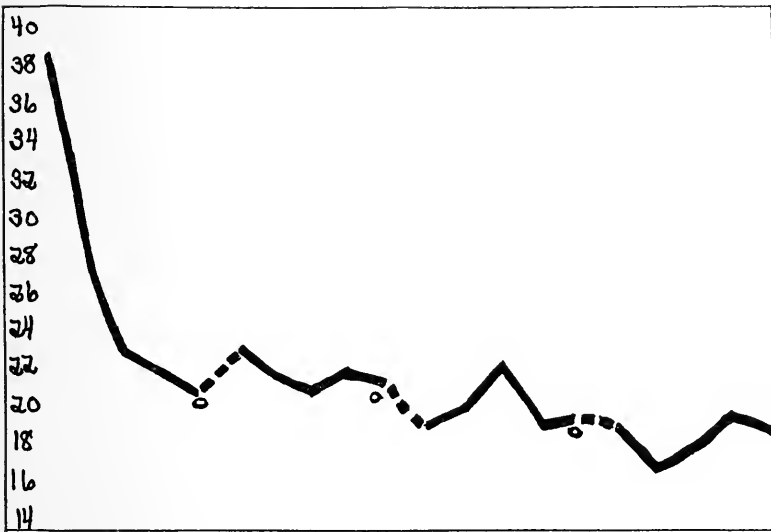


FIG. 10. Four Periods of Five Tests Each, on the Same Day.

Fig. 11 shows the results of a series of twenty tests taken in groups of five on four successive days; this was tried on 4 normal school students. Here the general character of the curves is regular. There are no losses which are not regained. These curves are more nearly like those of Fig. 5 than any previously considered.

The entire gain made was 31 seconds, gain first half was 24 seconds, gain last half was 7 seconds. The first gain was over three times last gain.

Comparing the results of Fig. 11 with those of Fig. 5, we find that the gain made by the former which was 31, was more than that made by the latter.

This shows that continuous practice periods, if not too long, are of value in that there is no time for "forgetting" to enter in.

The carrying out of this idea in the work of the lower grades

would be advantageous, for the little ones easily forget if drills are not frequent.

The series in which the greatest gain was made was one in which the tests were taken twice a day, two at each period, for five successive days. Four normal school students took part in this experiment.

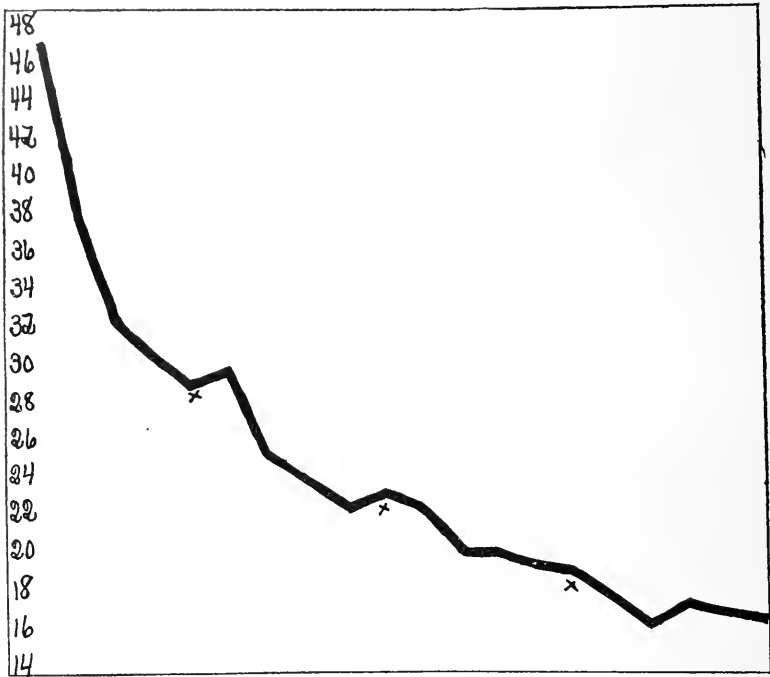


FIG. 11. Five Tests a Day on Four Successive Days. The end of each day's practice is indicated by a cross below the curve.

The results, as seen in Fig. 12 (average of the average results), show unusual uniformity up to the tenth test, from there on the curve is much less regular.

The gain made during this series of tests was 39 seconds, the gain first half was 32 seconds, the gain second half was 7 seconds, the former gain being over four times the latter gain.

Comparing the above results with the corresponding results of the regular series, we find that this special group gained more through the first half than did those who took the tests in the regular way. This however may be in part accounted for by the fact that the initial rate of speed of this special group was much slower than was the rate of speed attained in the regular tests at the beginning, thus affording more chance for gain on the part of the special group.

Taking two tests twice a day for five days appears to be more effective than taking them one a day for twenty days or five a day for four successive days.

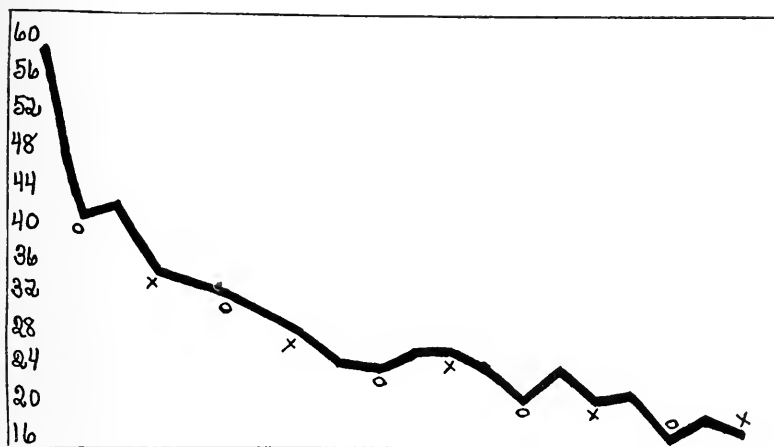


FIG. 12. Two Tests Twice Each Day, on Five Successive Days.

Beginning with Fig. 13 we have the tests taken first with the a-x key, then the a-o key, that the effect of the interference may be noticed, and the part it plays in the practice determined.

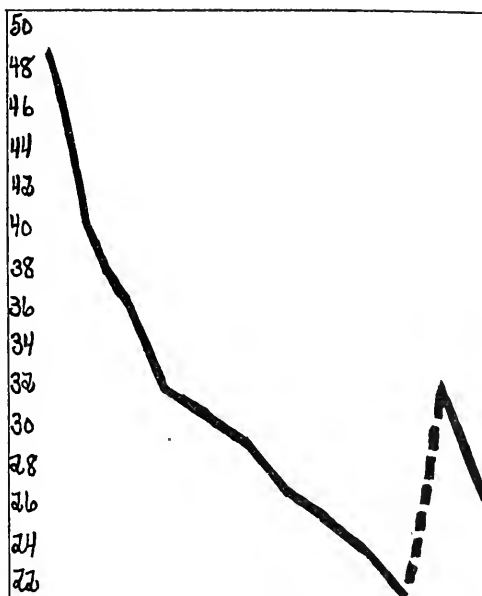


FIG. 13. Interference.

Fig. 13 shows the results of 10 a-x tests, then an interval of one week followed by one a-o test, then another a-x test. The interval of one week is represented in the curve by the broken line, and the line that follows shows the result of the a-o tests.

The practice and knowledge gained in doing the a-x series of ten tests aided much in doing the tests with the a-o key. Practice in doing or learning one thing helps in the mastery of other things of a like character.

Groups of papers were received where ten tests with the a-x key were taken followed immediately by 8 tests with the a-o key. In contrast to this group there was another set of papers of the same number where an interval of one week came between the two series.

Table showing results of papers where there was no interval between a-x and a-o series:

| | | |
|------------------------------------|---|--------------------------|
| 1st trial a-x 43 seconds | } | Difference of 10 seconds |
| 1st trial a-o 33 " | | |
| 10th trial a-x 21 " | } | " - 2 " |
| 10th trial a-o 23 " | | |
| | | = 8 " |

Table showing results of papers where an interval of one week came between the a-x and a-o series:

| | | |
|------------------------------------|---|--------------------------|
| 1st trial a-x 58 seconds | } | Difference of 21 seconds |
| 1st trial a-o 37 " | | |
| 10th trial a-x 23 " | } | " - 4 " |
| 10th trial a-o 27 " | | |
| | | = 17 " |

The above tables show that though the amount of gain was more where the week's interval came between the two series, the proportionate gain varied but one second. This shows that the short interval of one week had slight if any effect.²

So far, the results reported have been from adults. The first series with children consisted of 10 tests with the A-X key, taken, one each day in the morning, by six children from the seventh and eighth grades; the average age was 11 years, 7 months.

The gain made by the children during the 10 tests was much greater than that made by the normal school students ("regular series") in the same number of tests. The gain made by the stu-

² In other words, practice with the use of the A-X key decreased the time for the first trial with the A-O key by 10 seconds in one group and by 21 seconds in the other group, while the difference between the tenth trials of the A-X and the A-O series was in the first group 2 seconds and in the second group 4 seconds—which indicates that the practice effect is proportionally the same in the two cases.

dents in the first ten tests of the regular series was 21 seconds; that made by the children in the same number of tests was 48 seconds, more than twice as much.

| | |
|--|------------|
| Gain in first five tests—adults | 16 seconds |
| Gain in first five tests—children | 34 “ |
| Gain in second five tests—adults | 5 “ |
| Gain in second five tests—children | 14 “ |

From the above we see that the gain of adults, in the first five tests of the “regular series,” was three times as much as in the second five tests; while the gain made by the children in the first five tests was twice their gain in the second five.

The children began their tests at a much lower rate of speed than did the normal school students, the average time for the first “trials” or lines by the students being 47 seconds, and by the children 88 seconds. The best records among the children were, however, about as good as the best records among the normal school students.

Tests were also taken after school, at four o’clock, by six children from the seventh and eighth grades. The average age of these children—11 years, 7 months—was the same as the average age of the children in the preceding group, who were tested in the morning.

From the following table we find that there is an average loss of 10 seconds when the tests are taken at night:

| | Tests taken A. M. | Tests taken P. M. |
|---------------------------|-------------------|-------------------|
| Gain in first half | 34 seconds | 25.7 seconds |
| Gain in second half | 14 “ | 12.5 “ |
| Total gain | 48 “ | 38.2 “ |

This indicates that with the children, as well as with adults, the morning work is of more value.

Besides the results received from the children of the seventh and eighth grades, I also had some papers from twelve little children of a third grade. I took the tests myself with these children, taking six of the children for the tests in the morning and six children for the tests after school. The average age of these little ones was eight years.

Charts were also plotted to show these results, the chart representing the tests taken in the morning is not on exactly the same basis as others because one or two of the little children were unable to do the entire first five tests, some only doing the first three trials in the time at our disposal.

With the little ones it took some time for them to learn what they were expected to do and how to do it, but once this part was understood, their gains were rapid.

In studying Fig. 14 we find that the gains were not as gradual as they might have been, the very great gains came at the beginning but toward the end the gains were of a more equal length. We find the greatest gain to be at the first of the curve—a gain of forty seconds. As the practice continues the amount of gain decreases. The total gain made by the children taking the tests in the morning was 138.1 seconds.

During the tests taken after school an average gain of 108 seconds was made, being 30 seconds less than the morning gain.

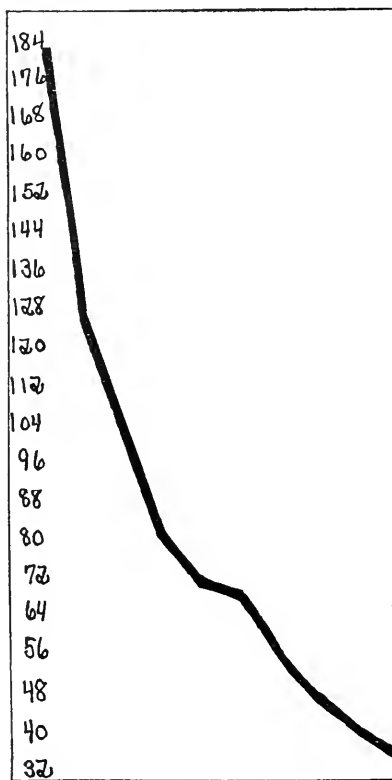


FIG. 14. Ten Tests taken A.M. on Children of Third Grade. Average results.

From studying Fig. 14 one can readily see how enormous are the gains made by the children as compared with those made by the normal school students.

If we consider some of the individual papers of the children we find that in many places there is evidence of no real gain whatever, but this period of standstill is not truly one of no gain, for after these resting periods, as we may call them, great gains are frequently

made and also kept. It seems almost as though we might call these periods of assimilating, for the acceleration which follows shows that some learning must have been going on or otherwise the sudden gains would not have ensued.

It was intensely interesting to watch the little ones as they were taking the tests. They were all greatly interested in doing the exercise and were especially anxious to know the progress they were



FIG. 15. Practice Curves of Elderly Persons. A shows the results obtained, in 7 tests, by an individual 72 years old; B shows the results obtained, in 10 tests, by an individual of 60 years.

making and how it compared with that made by their friends. Encouragement did much in raising the record and the trying to outdo their friends held the interest of the children and proved the best incentive to doing the work.

After an afternoon spent almost entirely in drawing, the tests were taken, and the weariness of the children influenced the rate of progress greatly. Their interest in the doing of the tests was much less than it previously had been and the gains they made interested them little. It was only with great coaxing and encouragement that they were able to be kept long enough to finish the tests.

In two instances, children having a headache could not work nearly so quickly as they had been accustomed, and one little girl who had a hard cold was unable to do more than three trials of one test, and to do this amount she took as much time as she usually would require to accomplish the ten trials.

These instances show that the physical condition of a child, especially, has much influence on his mental ability.

Having tested the normal school students and some few children, I was interested to know how tests of older people would compare with the previous tests of children and students. This study I could not carry very far, for subjects were hard to find. However, the tests were taken in the "regular" way—one test a day—by two elderly individuals, a gentleman of seventy-two years, and a woman of sixty years. Fig. 15 shows the results obtained by these two. Curve A is very similar to the corresponding curves on the charts which represent the results of the children's tests, while curve B is more nearly like the corresponding curve in Fig. 5.

After a period of five months or so, during which time no tests were taken, the subjects who had previously taken the tests were asked to try one test more, of ten trials, that it might be seen whether the learning was permanent or not, and if so to determine where it was the most so.

This was done and the following table shows the result.

From this table we find by comparing results of the first trials before the interval with the first trials after the interval that in every case save two there was a gain at the beginning of the period after the interval, showing that the knowledge gained from practice five months previous still in part remained.

In the two instances where no gain was made during first trial after the interval over first trial before interval we have good proof that the forgetting played an important part.

It is not surprising that this is the result where all the tests were taken at the same time or even where they were taken four different periods on the same day.

TABLE XI

| | 1st Trial | Best Av. | Last Av. | Last Trial | | 1st Trial | Last Trial | Av. of Test after Interval |
|---|--------------|-------------|-------------|---------------|-----------------------|--------------|---------------|----------------------------------|
| 1. General test..... | 47.6 | 13.4 | 13.4 | 13.8 | Interval, five months | 33.6 | 21 | 28.4 |
| 2. All test, one period..... | 53.7 | 21.1 | 31.7 | 37.5 | | 60.7 | 33.7 | 40.8 |
| 3. Four different periods, same day..... | 44 | 14.9 | 17 | 15 | | 45 | 28 | 31.4 |
| 4. Ten tests, two successive Saturdays..... | 53.5 | 18.2 | 18.2 | 17.7 | | 41 | 29 | 33.7 |
| 5. Two tests, twice a day, five successive days... | 90.6 | 17.1 | 17.1 | 15 | | 42.3 | 31 | 34.3 |
| 6. Children's tests, 7th and 8th grades, A. M..... | 88.8 | 14.8 | 20.6 | 19.3 | | 51.2 | 26.2 | 35.5 |
| 7. Children's tests, 7th and 8th grades, P. M..... | 66.5 | 22.5 | 22.9 | 18 | | 36 | 24.2 | 27.5 |
| 8. Children's tests, 3d grade, A. M..... | 23.9 | 24 | 25.9 | 24.5 | | 68 | 33 | 42.8 |
| 9. Children's tests, 3d grade, P. M..... | 25.0 | 35.5 | 35.5 | 22 | | 86.7 | 55.7 | 61.7 |

If we compare the averages after the interval with the last ones before the interval we may, I think, form a just estimate of how great a part the long interval played. Where all the tests were taken at one period, as well as where they were taken from different periods of the same day, it would be more accurate, it seems, to compare the best average of these two groups with the average after the interval.

Considering the groups, of the normal school students, we find the loss caused by the interval to be rather more marked where the tests were taken all at one period, and less marked where the tests were taken daily.

With the children's tests we find that where the tests were taken in the afternoon by the seventh and eighth grade children the interval caused the least effect. With the little children who took the tests in the afternoon the interval caused the greatest effect.

From observation of those taking the tests, as well as from written statements from many of them, some of the conditions which influenced progress were made apparent.

1. Physical condition of subject, most noticeable in the nervousness which followed inability to find a certain letter in quick time; headache was accountable in several instances for lack of power to work quickly.

2. Temperature of the room—if the room was warm, work was much slower than usual; if too cold the same result was noticeable.

3. Interruption of any kind barred progress. This was especially true with the children. Once their minds were off their work, it was hard for them to concentrate themselves upon it again for some time.

4. "Mind-wandering"—thinking of outside things—caused decrease in rapidity of action.
5. If subjects were in a hurry, for any reason, the work was slower than usual.
6. Weariness from school work made a great difference in the records.
7. If an unusually strong effort was put forth to do the work quickly, without fail undesired results would follow.

BRIEF SUMMARY OF RESULTS

1. The greater gains in the process of learning to do something are at the first of the practice.
2. Periods of morning work are more effective than the afternoon periods.
3. Children work much slower to begin with than do adults, but the gains made by them are greater. The gains of the adults, however, are more even and uniform than those of the children.
4. Short and frequent periods of practice are more valuable than long extended ones.

Editor's Comment.—The test sheet and key used in the above experiments are reproduced above that others may use them if they so desire. The exercise has proved very serviceable, both as a means of making a simple research and for illustrating a number of truths taught in the psychology class.

As a research, while revealing little that is entirely new, it helps to confirm and emphasize, and suggests some truths that have not as yet received sufficient attention. The comparison of the learning curves of children, adults and the aged is interesting, but the questions of greatest importance raised by the study are those concerning the number of repetitions at one time and the length of intervals between practice that are most favorable to rapid and permanent learning.

To what extent an individual curve of learning and fatigue is typical of all learning by that individual is also a matter of great theoretical and practical importance.



THESIS IX

FATIGUE IN HABIT FORMATION

EXPERIMENT BY MARIAN F. LANE

The same test-sheet and key sheets which were used in the preceding study and described on p. 36 were also employed in the study of fatigue.

This discussion is too extensive to be quoted in full, and parts given alone would not be clear without considerable explanation. In general, the results are what might be expected; such as decrease in rate of improvement, or irregularity in the record where a number of tests were taken at one time and usually less rapid improvement in the afternoon than in the morning. Even in a single test there seems to be evidence of fatigue, for in the sixth to eighth trial there is usually little or no improvement, sometimes a loss. The poor record made after a drawing lesson indicates that the fatigue is largely local rather than general, and perhaps mainly motor. There is probably no actual inability to maintain the rate but decreased tendency to do so.

The experiment is a good one with which to illustrate to a class the phenomena of fatigue as well as those of learning processes and habit formation.

THESIS X

WAYS OF LEARNING VISUAL FORMS

BY MAY N. HILLS

Thesis.—I placed before the pupils of the first, third, sixth and eighth grades and before the normal school students five meaningless figures based on geometrical forms. I asked the pupils to study the figures, but did not suggest any particular way of studying them. I allowed ten minutes. Then I took away the figures and asked the pupils to draw them. After the drawing, I asked the pupils to answer the following questions:

1. How did you learn the figures?
2. Did you move your hand or any part of your body in the shape of the outline while studying?
3. Did you associate the figures with any familiar shape or object?
4. Did you study the parts of the figures separately or try to think of words which would describe the parts?

From the first grade, of course, I received only oral answers, which could not be tabulated, but I learned much about the characteristics of little children. I marked the papers received from the third, sixth and eighth grades and normal school students as to the general appearance of the drawings they had made and then as to the perfectness of the details in the drawings. In marking the papers, I tried to keep one standard of excellence for *a*, another for *b*, and another for *c*, without regard to grade or sex. After marking all the papers, I found the per cent. receiving *a*, *b* and *c* respectively, as to the general appearance, and then as to the more detailed representation.

Next I found the per cent. of correspondence between the general appearance and the detail—that is, what per cent. of those who got *a* in the general, got *a* in the detail also.

My next problem was to find how pupils learn. Very often a teacher places a lesson—spelling, for instance—on the blackboard and tells the class to write each word five times or else she gives them no direction for learning. So it seemed important to try to know something of the natural ways in which children learn. For if we, as teachers, can appeal to a natural method, it saves much energy and time for both teacher and pupil.

After reading the answers for both the children and the students, I was able to make four classifications: first, those who learned by moving the hand or some part of the body in the direction of the outline of the figure to be learned; second, those who associated the figure or a part of it with some object or figure already familiar; third, those who tried to learn the figures as wholes; and fourth, those who analyzed the parts, learning only a part at a time.

According to Table XII., it is seen that as to the general appearance of the figures the normal school students received a higher mark by only a few per cent. than the pupils of the eighth grade; and also it may be noticed that the increase in ability to remember the general appearance is gradual, but with more variation between the sixth and eighth grades, 47 per cent. of the normal school students receiving *a*; 30 per cent. of the eighth grade; 27 per cent. of the sixth grade, and 26 per cent. of the third grade. In the third and eighth grades the boys did the best, but in the sixth grade the girls took the lead. This difference between the ability of the girls and boys is even more noticed as to the detailed appearance of the figures.

Fifty-seven per cent. of the normal school students received *a* as to the detailed correctness of their drawings; 13 per cent. of the eighth grade; 11 per cent. of the sixth grade, and 8 per cent. of the third grade. Here the difference in ability in remembering many details between the normal student and the pupil of any grade is quite marked.

Table XIII. shows the per cent. of students and pupils receiving *a*, *b*, *c*, as to the general appearance, who also received the same mark in detailed appearance.

Table XIV. I found the most interesting and instructive. This shows the method by which each child learned the figures. Nearly all the students and pupils used a combination of two or three methods and several used all the methods. The normal school student depended the most upon association in remembering the figures, 92 per cent. using this method, while 37 per cent. consider it the most important method of learning; but the children consider the learning of wholes as wholes the most important. For example, one typical normal school student writes:

"In order to place the figures better in my mind I at once thought of their likeness to other things. Upon looking at the first one, I noticed that the upper, lower and left hand sides were straight lines put together so as to form a square. The fourth side made me think of a crude drawing of a human face. The second figure looked like an Indian tent; the third one like a semicircle on an axe; the fourth one like writing, and the fifth like an oak leaf."

Let us next notice what importance was assigned to the motor element in learning. Eighty-eight per cent. of the third grade, 80 per cent. of the sixth grade, 76 per cent. of the eighth grade and 40 per cent. of the normal school students used this method. Nearly all the children said that they moved their finger on their desk or in the air while learning. When they thought they could draw it, they looked away from the figure and tried to draw it with the finger. This method seemed most natural to them, but as the children advanced in age and in grade they gradually lost the motor method of drawing, or rather of learning; and when we come to the normal school student, we find that the only form of the motor element existing is the moving of the eyes around the figures just as the child moved the finger. There may be two causes for this; first, the natural instinct toward motor learning may be less strong as the child grows older; second, this natural instinct may have been repressed so often through the discipline of the school room that the older students do not have so strong a tendency to use this method. Only 9 per cent. of the normal school students consider this method the most important; 16 per cent. of the eighth grade; 24 per cent. of the sixth grade, and 40 per cent. of the third grade.

As mentioned before the normal school students consider the learning by association the most important method, but as we come down through the grades we find the method decreasing in popularity. Ninety-two per cent. of the normal school students use it; 86 per cent. of the eighth grade; 68 per cent. of the sixth grade, and 48 per cent. of the third grade. While 41 per cent. of the eighth grade consider it the most helpful method, only 5 per cent. of the third consider it the most helpful. In comparing the drawings with the methods used, I found that those who used this method—association—modified their images so that often the drawing looked more like the figure with which it was associated than like the original form. For example, an eighth grade boy said that the second figure “looked just like a pine tree” and his drawing did look decidedly like a pine tree.

All the children of the third grade used the method of learning by wholes to some extent. Ninety-four per cent. of the eighth grade and 75 per cent. of the normal school students used it, while 55 per cent. of the third grade considered this method most helpful; 45 per cent. of the sixth grade; 32 per cent. of the eighth grade, and 30 per cent. of the normal school students.

This fact may be given as one reason why so much smaller proportion of the children received *a* as to the details of their drawings than received *a* as to the general appearance. Naturally children

see the whole thing at once, instead of analyzing. Only 8 per cent. of the third grade used the method of analysis, while 57 per cent. of the normal school students used it.

After several days had passed since the students and children had seen the original figures, I asked them to draw the figures again from memory. Then I asked them which method helped the most in remembering the figures. These papers I did not tabulate but from them I learned many facts. Those who considered the motor element of learning very important the first day they drew the figures said that the motor element did not help them so much when they had to remember the figures for several days. The normal school students considered this method "a quick method of learning but the easiest to forget." While many who did not realize that association helped them the first day say that it helped them to remember for a longer period. One student writes:

"The first three figures which I associated with a familiar object came back readily to-day, but the others which I had learned by hand tracing did not come back so readily."

It is interesting to notice the combinations of methods used and the results obtained from various combinations. Nearly all the students and pupils who received an *a* in both general and detailed appearance used a combination of three or four methods, while those who were marked *c* rarely used more than one or two methods. The normal school students obtained the best results by studying the figure as a whole first and then spending much time in associating it with other known figures and analyzing it. The children of the third grade obtained the best results by studying the figure as a whole carefully and then tracing it with the finger many times. When they thought they could draw it, they looked away and tried to trace it in the air or on the desk; if they couldn't do it, they studied it some more.

As the children grow older imagination or association seems to take the place of the motor element; and the tendency to reason and analyze grows with age. These facts too often pass unnoticed in the school room. Many teachers who do good work with older children fail with the little pupils because they do not realize the importance of the motor learning to the undeveloped mind. And the reverse is equally true. The motor process of learning must be used but not so constantly that as the child grows older he will lose the power to analyze and to reason.

TABLE XIV
SHOWING THE METHOD OF LEARNING

| Method | I | II | III | IV |
|---|----|----|-----|----|
| Per cent. of normal school students using, | 40 | 92 | 75 | 57 |
| Per cent. of eighth grade using, | 76 | 86 | 94 | 22 |
| Per cent. of sixth grade using, | 80 | 68 | 100 | 18 |
| Per cent. of third grade using, | 88 | 48 | 100 | 8 |
| Per cent. of normal school students helped most by, | 9 | 37 | 30 | 22 |
| Per cent. of eighth grade helped most by, | 16 | 41 | 32 | 7 |
| Per cent. of sixth grade helped most by, | 24 | 20 | 45 | 3 |
| Per cent. of third grade helped most by, | 40 | 5 | 55 | 0 |

Method I. is by motor tracing.

Method II. is by association.

Method III. is by wholes.

Method IV. is by analysis.

Editor's Comment.—This and the two studies following are representative of forms of study that can be made and that should be made frequently by intelligent teachers who are not satisfied with the mechanical learning of lessons, but who wish to economize the time of their pupils and help them to gain the power to direct their activities to the best advantage.

The results of this study suggest that probably movements are of greatest importance when habits are to be formed, but that recollection of specific things after an interval is best insured by associative memory.

THESIS XI

METHODS OF LEARNING VISUAL FORMS

BY EDNA L. BATTLES

Thesis.—To test the methods of learning in the different grades, I drew three figures. The first figure was composed of a circle, a triangle, a rectangular shape which was pointed at one end, and a figure resembling an oak leaf and having five points. The second figure was made up of the same parts differently arranged. The third figure was entirely different. The island of New Guinea was taken as a basis for the form. This island was taken because it was thought that the pupils had probably never studied it to any great extent nor learned to draw it, so that they would not be familiar with its shape. It was simplified somewhat but the general shape was preserved. The dividing lines between the Dutch, German and British territories were put in the figure, also the two largest rivers. Two marks indicating capitals and two dots indicating cities were also added.

The tests were taken in the second, fourth, sixth and eighth grades. Three tests were taken in each grade. In the first test the pupils were asked to learn the figure and were allowed to learn it in the way they chose; in the second test they were asked to look at the figure, and then to shut their eyes or look away and see if they could see a picture of the figure; in the third test the pupils were asked to learn the figure by drawing it on the desk with their finger. In each test, they were then given four minutes in which to study the figure; after which time they were required to draw it from memory. The tests were given in the afternoon; in nearly every case (except where there was no recess) they were given directly after the afternoon recess.

I went over the tests, marking them as to general form, detail and proportion. The *general form* was marked with the letters from *a* to *g*, according to the correctness of the form; *a* being used when the form was correct; *b*, *c* and *d* as the forms were less correct; *e* when there was no resemblance to the original form; *f* when only a part was drawn, and *g* when nothing was drawn. In grading the first two figures for *detail*, the circle, the triangle, the rectangular form, the shape of the leaf and the number of its points each counted as one. The details of figures 1 and 2 thus numbered five. In

figure 3 each dot representing a city, each river, each boundary line and five parts, either points or curves of the figure each counted as one, making the number of details equal thirteen. In marking the proportion of parts, the letters ran from *a* to *e*.

The tables are made on the standard of twenty-five boys and twenty-five girls in each of the four grades used. Table XVI. gives the distribution of the total marks for general form and proportion in each test for each grade.

TABLE XV

| Grade | Test I | | | | | Test II | | | | | Test III | | | | | | | | |
|-------|--------|-----|-----|-----|----|---------|----|-----|----|----|----------|---|----|----|----|----|---|---|---|
| | a | b | c | d | e | f | a | b | c | d | e | f | a | b | c | d | e | f | g |
| II. | 2 | 8 | 10 | 23 | 6 | 1 | 2 | 3 | 13 | 20 | 9 | 3 | 5 | 7 | 13 | 12 | 8 | 5 | |
| IV. | 4 | 11 | 15 | 14 | 6 | | 5 | 11 | 16 | 12 | 6 | | 6 | 7 | 11 | 20 | 6 | | |
| VI. | 7½ | 11½ | 17½ | 11½ | 2½ | | 7½ | 17½ | 15 | 7½ | 2½ | | 8¾ | 8¾ | 20 | 7½ | 5 | | |
| VIII. | 18 | 16 | 13 | 2 | 1 | | 17 | 16 | 13 | 4 | | | 25 | 14 | 9 | 2 | | | |

Girls

| Grade | Test I | | | | | Test II | | | | | Test III | | | | | | | | |
|-------|--------|-----|-----|-----|----|---------|-----|-----|-----|----|----------|---|-----|-----|-----|----|----|---|---|
| | a | b | c | d | e | f | a | b | c | d | e | f | a | b | c | d | e | f | g |
| II. | 1 | 6 | 10 | 20 | 12 | 1 | 2 | 4 | 7 | 22 | 12 | 3 | 4 | 7 | 9 | 17 | 11 | 1 | |
| IV. | 5 | 8 | 14 | 22 | 1 | | 3 | 11 | 14 | 19 | 3 | | 7 | 7 | 15 | 15 | 6 | | |
| VI. | 7½ | 12½ | 15 | 12½ | 2½ | | 15 | 17½ | 12½ | 5 | | | 10 | 7½ | 18½ | 10 | 3¾ | | |
| VIII. | 23½ | 13¾ | 11½ | 1½ | | | 26½ | 16½ | 2½ | 3¾ | 1½ | | 22½ | 18¾ | 7½ | 1½ | | | |

In the second table, 7 was substituted for *a*, 6 for *b*, 5 for *c*, etc. The number of *a*'s was multiplied by 7, the number of *b*'s by 6, etc. The results were added and the total was placed in the table. The number of details which were right in each test were also added and put in the table.

TABLE XVI

| Boys | | | | | | | | |
|----------------|---------------------------------|--------------------------------|----------------------------------|--------------------------------|-----------------------------|--------------------------------|--------|--------------------------------|
| Grade | Test I Child's own Method | | Test II Imagination Method | | Test III Motor Method | | Total | |
| | Detail | Gen. Form and Proportion | Detail | Gen. Form and Proportion | Detail | Gen. Form and Proportion | Detail | Gen. Form and Proportion |
| | | | | | | | | |
| II. | 62 | 224 | 60 | 210 | 78 | 224 | 200 | 658 |
| IV. | 102 | 243 | 113 | 247 | 105 | 237 | 320 | 727 |
| VI. | 118 | 260 | 105 | 270 | 120 | 259 | 343 | 789 |
| VIII. | 135 | 298 | 143 | 296 | 180 | 312 | 458 | 906 |
| Total | 417 | 1025 | 421 | 1023 | 483 | 1032 | 1321 | 3080 |
| Total | 1442 | | 1444 | | 1515 | | 4401 | |
| Girls | | | | | | | | |
| II. | 59 | 211 | 63 | 203 | 68 | 219 | 190 | 633 |
| IV. | 106 | 244 | 104 | 242 | 122 | 244 | 332 | 730 |
| VI. | 114 | 260 | 115 | 293 | 133 | 260 | 362 | 813 |
| VIII. | 151 | 310 | 146 | 313 | 165 | 313 | 462 | 936 |
| Total | 430 | 1025 | 428 | 1051 | 488 | 1036 | 1346 | 3112 |
| Total | 1455 | | 1479 | | 1524 | | 4458 | |
| Boys and Girls | | | | | | | | |
| II. | 121 | 435 | 123 | 413 | 146 | 443 | 390 | 1291 |
| IV. | 208 | 487 | 217 | 489 | 227 | 481 | 652 | 1457 |
| VI. | 232 | 520 | 220 | 563 | 253 | 519 | 705 | 1602 |
| VIII. | 286 | 608 | 289 | 609 | 345 | 625 | 920 | 1842 |
| Total | 847 | 2050 | 849 | 2074 | 971 | 2068 | 2667 | 6192 |
| Total | 2897 | | 2923 | | 3039 | | 8859 | |

The table shows, in regard to *detail*, a great improvement from the second to the fourth grades, no great change from the fourth to the sixth grades, and again a great improvement from the sixth to the eighth grades. In test II. the boys of the fourth grade actually surpassed those of the sixth; but this result is perhaps accidental, as it is due to the great success of two or three boys in the fourth grade—who ranked as high in the number of correct details as the best of the eighth grade—combined with the very low rank of two or three boys in the sixth grade.

The gain in *general form and proportion* is usually gradual from grade to grade. It totals less, from the second to the eighth grades, than the gain in number of correct details. The number of correct

details is doubled and a little over, while the general form and proportion is not very much better in the eighth grade than in the second. The younger children get the general form of the figure much better than they get the details. They see anything as a whole, and have not yet learned to look for the parts. One important phase of the primary teacher's work is to lead the child to see the details in the things around him.

One very interesting thing is the number of times that the figures were reversed. Figures 1 and 2 were often reversed and usually it was after one or the other of them had been learned before. There were most reversals in Grade IV., there being very few in the other grades.

In regard to the relative success of the *three methods of learning* used respectively in tests I., II. and III., we find from Table XVI. that, for all the children taken together, the motor method gave better results than either the method in which the children were directed to close their eyes and imagine the figure or the method of the child's own choosing. This superiority of the motor method is much more marked in correctness of details than in general form and proportion. The importance of motor methods in school work is indicated by these results.

Looking at the results of each grade separately, we see that the motor method of learning is by far the best for the second grade, while the imagination is very poor. The importance of the motor method was brought very forcibly to my mind in giving the tests in this grade. When the children were learning their figures by the choice or motor methods, a great many of them moved their whole body in the direction in which they would move their fingers when drawing the figure. In the fourth and sixth grades the imagination tests begin to gain prominence, showing that the children are gaining the power to form images.

The question arises, Would it not be better to lead the pupils to learn by a method which is found to be best for children in that grade than to allow them to learn as they choose? It would seem from the results of these tests that it would be much better to direct them as to the way they should study, especially in the low grades. The choice tests do not give the best results, as perhaps one might expect, but it was where some specified method was prescribed that the best results were obtained. If the children had better results when some specified method was used, with only one trial, does it not seem probable that there would be still greater improvement if it was continued?

The individual child, however, should be studied. Some children

are greatly helped by having the method of learning suggested. For instance, there was a boy in grade II. who advanced from *e* in the choice test to *a* in the motor test for correctness of general form. He also gained in details and proportion although not so much. That boy certainly was helped, that time at least, by having the method of learning suggested to him. Of course there might have been other things which combined to make it better. *The motor test was the last test given*, and as this was probably the first time that the children in this grade had ever done anything of the kind they had grown more accustomed to doing it in the last test and so could put their minds more entirely upon it. Another child would be greatly hindered in its development if forced to learn by some specified method. There was one girl in grade II. who fell, in general form, from *b* in the choice test to *f* in the imagination test; and her loss in detail and proportion was nearly as great. This time, at least, the girl was hindered in her learning by having to learn by the imagination method. She however ranked quite high in the motor test.

While the tabulated results show that the majority of the children gained in the motor test, there were very few cases where there was a great difference. There was one boy in Grade II. who gained from *f* in the imagination test to *b* in the motor for general form; in details he gained from 1 to 4, and in proportion from *e* to *b*. This shows again the great value of the motor method of learning for some individuals, especially young children.

Although this study is made of the learning of visual forms and seems very narrow, it may be applied to many phases of the school work. In the map drawing in the higher grades it should be remembered that it is important that the children shall have plenty of practice in drawing the maps and that they shall have an image of the map. In the manual training department, a knowledge of how to use the tools will not suffice. There must be practice in using them. Also in the study of the sciences, we find this recognized and see that in a great many schools, the pupils try the experiments themselves instead of merely getting an image of the results from descriptions which they read in books or which the teacher gives them. When the small children are learning to read, it helps to impress it more deeply upon their minds if when they are learning a new word, they learn to speak it, as well as get an image of its form. Thus we find that in all the school work, when possible, the children should "learn to do by doing."

THESIS XII

HOW CHILDREN STUDY

BY MARTHA JOSEPHINE BALDWIN

Thesis.—The following questions were sent to teachers in the grades and high school to be answered by the pupils:

1. How long did you spend on this lesson?

Was it a study period?

2. Were you interrupted at all?

3. How did you try to learn the lesson?

4. How did you know you had your lesson?

The pupils were not allowed to see the following question until after they had finished the preceding ones?

5a. Did you try to learn the words of the book?

b. Did you write down any part?

c. Did you use an outline?

Papers were received from the sixth, seventh, eighth and ninth grades, and from the four classes of the high school, altogether numbering four hundred and five: two hundred and thirteen girls and one hundred and ninety-two boys.

The lessons had been prepared the day before and the questions were answered upon one special lesson: history in the sixth and seventh grades and in the freshman and sophomore classes, geography in the eighth, grammar in the ninth, and German in the junior and senior classes. Two typical papers are given on the following pages.

Girl.

Subject, Grammar.

Ninth Grade.

Age, Fourteen.

1. I spent three quarters of an hour on the lesson.

It was a study period.

2. I was not interrupted.

3. I tried to learn the lesson by first reading it, then learning some of the rules by heart.

4. I knew I had my lesson by reciting it to myself.

5a. I did not try to learn the words of the book.

b. I wrote a little down.

c. I did not make an outline for any part of it.

Boy.

Subject, History.

Freshman.

Age, Fifteen.

1. I studied my lesson fifty minutes.

It was not a study period.

2. My dog barked and I had to go to speak to him.

3. Concentrated myself for the length of time stated.

4. I answered the questions which I expected Miss B would ask us.

5a. Partly.

b. I did not.

c. I wrote out part of the lesson.

The papers received were studied for the characteristics shown by the answers to the questions. Then I obtained from the high school teachers, records of the pupils' standing received in the studies concerning which these papers were written for the previous eight weeks. The system runs in A, B, C, D; A being the highest mark.

There are twelve different methods of study used. They divide into two great heads, the word methods or studying simply words, and the thought method, illustrated by one quotation which says "I tried to understand the lesson as I studied it." Under the first head are included reading, reading and reciting, reading and writing, reading by sections, reading and using other books, and learning by heart. The thought method includes reading for story, reading to understand, concentrating self, trying to answer questions, finding important facts, and merely spending time required. According to Table XVII. it is found that 82 per cent. of the children used the word method of learning as shown above, leaving a very small per cent. whose answers indicate that they tried in any way to understand the content of the text. A larger per cent. of girls than of boys studied by the thought method.

TABLE XVII

HOW DID YOU STUDY YOUR LESSON?

| | | Grades | | | | | | | | | | | | | | | | | | | |
|---------|-----------|---------|-----|------|----|------|-----|-----|-----|------|----|----|----|----|----|----|-----|-----|-----|----|--|
| | | Grammar | | | | High | | | | Ages | | | | | | | | | | | |
| | | VI | VII | VIII | IX | X | IV | III | II | I | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | |
| Word | Boys | | | | | | | | | | | | | | | | | | | | |
| | Number | 11 | 16 | 32 | 22 | 34 | 5 | 24 | 8 | 3 | 16 | 15 | 31 | 20 | 21 | 17 | 18 | 8 | 1 | | |
| | Per cent. | 73 | 67 | 86 | 57 | 92 | 100 | 100 | 73 | 75 | 76 | 56 | 76 | 83 | 78 | 94 | 90 | 89 | 100 | | |
| Thought | Boys | 20 | 18 | 44 | 43 | 49 | 69 | 71 | 97 | 27 | 20 | 23 | 55 | 17 | 46 | 47 | 45 | 54 | 75 | | |
| | Number | 4 | 8 | 5 | 17 | 3 | | | 3 | 1 | 5 | 12 | 10 | 4 | 6 | 1 | 2 | 1 | | | |
| | Per cent. | 27 | 33 | 14 | 43 | 8 | | | 27 | 25 | 24 | 44 | 24 | 17 | 22 | 6 | 10 | 11 | | | |
| Word | Girls | 12 | 17 | 30 | 24 | 51 | 12 | 28 | 9 | 3 | 16 | 27 | 24 | 47 | 23 | 24 | 10 | 8 | 1 | | |
| | Number | 92 | 23 | 23 | 33 | 18 | 92 | 100 | 100 | 100 | 84 | 82 | 75 | 91 | 26 | 92 | 100 | 100 | 100 | | |
| | Per cent. | 27 | 19 | 27 | 40 | 60 | 69 | 78 | 46 | 30 | 24 | 21 | 39 | 45 | 62 | 53 | 48 | 62 | 65 | | |
| Thought | Girls | 1 | 4 | 7 | 8 | 9 | 1 | | | | 3 | 6 | 8 | 5 | 6 | 2 | | | | | |
| | Number | 8 | 77 | 77 | 67 | 82 | 8 | | | | 16 | 18 | 25 | 9 | 74 | 8 | | | | | |
| | Per cent. | 15 | 30 | 20 | 40 | 63 | 69 | | | | 17 | 30 | 63 | 53 | 48 | 65 | | | | | |

TABLE XVIII
How Did You Study Your Lesson?

| | Bors | | | | | | | | | | Girls | | | | | | | | | |
|-------------------------------|------|-----|------|----|----|----|-----|----|----|----|-------|-----|------|----|----|----|-----|----|----|-----|
| | VI | VII | VIII | IX | T. | IV | III | II | I | T. | VI | VII | VIII | IX | T. | IV | III | II | I | T. |
| Reading | 8 | 10 | 8 | 9 | 35 | 17 | 1 | 1 | 1 | 19 | 3 | 14 | 2 | 7 | 23 | 16 | 3 | 1 | 1 | 21 |
| Reading and reciting | 4 | 18 | 6 | 6 | 28 | 8 | 1 | 1 | 1 | 10 | 1 | 2 | 5 | 20 | 6 | 12 | 1 | 1 | 1 | 14 |
| Reading and writing | | 1 | 1 | 1 | 2 | | | | | | | | 2 | 4 | 1 | 1 | | | | 1 |
| Reading by sections | 3 | 1 | 3 | 4 | 11 | 9 | 1 | | | 10 | | | 4 | 18 | 23 | 15 | 6 | 2 | | 3 |
| Reading and using other books | 1 | 1 | | | 2 | 2 | 2 | 2 | 8 | 32 | | | 2 | 4 | 40 | 7 | 2 | 25 | 6 | 1 |
| Learning by heart | 1 | 1 | 1 | 2 | 3 | | | | | | | | 1 | 2 | 1 | 1 | | | | 1 |
| Reading for story | | | | | 1 | | | | | | | | 1 | 1 | 1 | 1 | | | | 1 |
| Reading to understand | 2 | 3 | 4 | 3 | 12 | 3 | | | 2 | 5 | | | 3 | 4 | 5 | | | | | |
| Concentrating self | 1 | 3 | 3 | 3 | 7 | | | | | | | | 3 | 3 | 7 | | | | | |
| Trying to answer questions | 1 | | 4 | 4 | 5 | | | | | | | | 6 | 4 | 5 | | | | | |
| Finding important facts | | 2 | 1 | 6 | 9 | | | | 1 | 1 | | | 2 | 1 | 1 | | | | | |
| Spending time required | 15 | 24 | 37 | 39 | | 37 | 5 | 24 | 11 | | | | 3 | 39 | | 37 | 5 | 24 | 11 | 192 |

| | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|----|----|----|----|----|----|----|----|---|----|---|----|----|----|----|----|----|----|---|-----|
| Reading | 3 | 14 | 2 | 7 | 23 | 16 | 3 | 1 | 1 | 21 | 3 | 5 | 9 | 3 | 16 | 6 | 2 | 2 | 1 | 47 |
| Reading and reciting | 1 | 2 | 12 | 5 | 20 | 12 | 1 | 1 | 1 | 14 | 1 | 3 | 5 | 7 | 12 | 3 | 3 | 1 | 1 | 34 |
| Reading and writing | 7 | 2 | 4 | 4 | 6 | 6 | | | | 1 | 1 | 1 | 3 | 2 | 2 | 1 | | | | 7 |
| Reading by sections | 1 | 1 | 3 | 4 | 18 | 7 | 4 | | | 23 | 8 | 5 | 5 | 7 | 8 | 7 | 5 | 1 | | 41 |
| Reading and using other books | | | 3 | 2 | 7 | 7 | 2 | 25 | 6 | 40 | 4 | 4 | 2 | 7 | 7 | 14 | 8 | 5 | | 47 |
| Learning by heart | | | 4 | 2 | 6 | 1 | | | | 1 | 1 | 3 | 3 | 2 | 2 | | | | | 7 |
| Reading for story | | | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 1 |
| Reading to understand | 1 | 1 | 3 | 3 | 8 | 2 | | | | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 1 | | | 5 |
| Concentrating self | | 2 | 3 | 4 | 9 | 3 | | | | 2 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | | | 10 |
| Trying to answer questions | | 1 | 2 | 3 | 4 | | | | | 1 | 1 | 2 | 2 | 3 | 2 | 1 | 1 | | | 9 |
| Finding important facts | | | | | | 3 | 1 | | | 4 | | | | | 3 | 1 | | | | 4 |
| Spending time required | 13 | 21 | 37 | 32 | | 60 | 13 | 28 | 9 | | 3 | 19 | 33 | 32 | 52 | 29 | 26 | 10 | 8 | 213 |

There are two of the twelve divisions which take the lead. The first is reading, which is used in the case of twenty-five per cent. of both boys and girls, being more popular with the boys. The other prominent method is that of reading and using other books. Twenty per cent. of all the papers show the use of this method, which is employed more by the girls than by the boys. In contrast with the simple reading method, this is used much more in the high school than in the grades, especially in the junior class. This is doubtless due to the fact that the papers came from German classes where the translation was done by the use of the German dictionary. In the ages, this method is used very much by the older pupils.

TABLE XX

| | | How Did You Know You Had Your Lesson? | | | | | | | | | | | | | | | | | | | |
|----------|-----------|---------------------------------------|----|----|-----|------|----|----|-----|----|---|----|----|----|----|----|----|----|----|----|-----|
| | | Boys | | VI | VII | VIII | IX | IV | III | II | I | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Tests | Number | 7 | 14 | 25 | 21 | 36 | 4 | 6 | 9 | | | 3 | 10 | 19 | 25 | 25 | 17 | 12 | 3 | 7 | 1 |
| | Per cent. | 47 | 67 | 74 | 62 | 67 | 57 | 43 | 38 | | | 43 | 59 | 62 | 64 | 63 | 56 | 67 | 23 | 70 | 20 |
| No tests | Number | 8 | 7 | 9 | 13 | 8 | 3 | 9 | 15 | | | 4 | 7 | 12 | 14 | 5 | 13 | 6 | 10 | 3 | 4 |
| | Per cent. | 53 | 33 | 26 | 38 | 33 | 43 | 57 | 62 | | | 57 | 46 | 38 | 36 | 37 | 44 | 33 | 77 | 30 | 80 |
| | | GIRLS | | VI | VII | VIII | IX | IV | III | II | I | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Tests | Number | 10 | 6 | 30 | 33 | 38 | 13 | 11 | 5 | | | 3 | 13 | 18 | 29 | 32 | 24 | 18 | 4 | 4 | 1 |
| | Per cent. | 67 | 43 | 79 | 94 | 83 | 81 | 63 | 55 | | | 60 | 57 | 64 | 94 | 87 | 80 | 77 | 45 | 75 | 100 |
| No tests | Number | 5 | 8 | 8 | 2 | 8 | 3 | 5 | 5 | | | 2 | 10 | 10 | 2 | 5 | 6 | 3 | 5 | 1 | |
| | Per cent. | 33 | 57 | 21 | 6 | 17 | 19 | 37 | 50 | | | 40 | 43 | 36 | 6 | 13 | 20 | 23 | 55 | 25 | |

Table XIX. shows how the pupils knew they had their lessons. Table XX. shows the same, only in different divisions, which are two, one in which the pupils tested themselves in some definite way and one where no definite tests were employed. It was found that higher marks were obtained by those using some sort of test. Boys of thirteen and sixteen and girls of thirteen and fourteen used tests more than those of any other age.

Of the nine classes of tests represented by the headings and quotations of Table XX. the most prevailing is the second, which is the proof by reciting either to one's self or to some one else by topics. Fifty-six per cent. of all used this test and it seems more popular among the girls. It is used more in the high school and most in the freshman class. The ages thirteen, fourteen and fifteen are the ones that used it most.

On comparing the results of my inquiry with the standing of the pupils in their studies, it was found that the average time spent in obtaining the highest mark was sixty minutes, the girls spending more time than the boys and the juniors and the seniors using the most. The preparation was at home, usually the pupils not being interrupted. The largest per cent. of those who obtained the highest

mark used the simple reading method, with nearly as many referring also to other books.

In obtaining the mark B, the average time spent was sixty one minutes, the boys spending more time than the girls, and the freshman class required more than the others. Here, also, the lessons were prepared at home in the afternoon with no interruptions. The method most used was that of reading and using other books.

A little more time was spent in obtaining the mark C, that is, sixty nine minutes and the boys spent more time than the girls. This preparation was also at home and in the afternoon, although the boys of the higher classes studied in the evening. They were not interrupted to any great extent and forty-four per cent. used the methods of reading and using other books, which applies more to the girls.

The greatest interest in the marks centers in the lowest one, for those receiving D were all boys, and the average time spent was one hundred and fifty minutes. They all studied at school with recitations going on around them and they were interrupted. The common method was reading, over and over again.

In drawing conclusions from these studies, the first which comes up is that the children study words rather than thoughts, that they study in a mechanical sort of way, which enables them to say they have studied the lesson and spent the time required. They read the words over and over, and doubtless get more confused the more they read.

This seems to me a great fault. Children should study to understand what they read and it will prove a quicker and surer method. This is one problem for teachers to solve, and it is certainly a very important one.

G. Stanley Hall says that at least three fourths of the time spent by a boy of twelve in trying to learn a hard lesson out of a book, is time thrown away, not in deliberate idling, but through unconscious mind wandering, lack of concentration, the unwise attempts of memorizing words of the text without proper assimilation of thoughts.

One most serious side of the problem is that most of the loss is experienced by boys and girls who are trying hard to master the lesson.

THESIS XIII

AN EXPERIMENTAL STUDY OF MUSICAL LEARNING

BY MARY G. GILLES

Thesis.—This study was made to ascertain the different methods employed in learning and remembering a series of tones and the best method of doing the same.

The reagents were nine normal school students, two instructors, and eight children from grades five to eight, and two high school students, making a total of twenty-one. Of this number nineteen have had practice, varying from considerable to a very little, in either playing or singing or both, one sang by note only and one could neither sing or play, and had no knowledge of notation, the keyboard or the relation of one tone to another though he could discriminate tones higher or lower than a given tone.

The experiment was made in four ways, the instrument used being a piano.

I shall refer to the different parts of the experiment as test I., II., III. and IV. Test I. consisted of a series of fifteen notes played to the reagent, who reproduced them from memory on the piano. Test II. comprised a series of fifteen notes which the reagent read from the score and reproduced from memory on the piano. Test III. contained a series of fourteen notes. These the reagent read and played from the score until he could reproduce them from memory. Test IV. was made up of a series of thirteen notes. They were played to the reagent who followed the score at the same time, completing the test by reproducing from memory.

The reagent was not limited as to time or number of trials but he attempted to reproduce as soon as he thought he could do so.

The children often tried to reproduce before they were able to do so, seeming to depend upon the trial and success method, while the adults, in most instances, did not attempt to reproduce from memory until they were fairly sure they could reproduce correctly, yet after reproducing they were not always sure that they had done it correctly.

It was noticeable that the first and last tones were reproduced more quickly and more accurately than the intervening ones, by both children and adults. This fact has been found to be true in all memory tests.

The children almost invariably began with the feeling that they couldn't do what was asked of them. They underestimated their ability and in many cases said they had reproduced the tones incorrectly simply because they thought it beyond them to do it. However by encouraging them and naming some of their little friends who had taken the tests, and said it was great fun, I succeeded in overcoming this fear.

Several of the adults and the children noticed the scale form in some of the series of tones given, and in that way recognized the series in less time than they would have otherwise.

Six of the adults failed to recognize a series as correct after playing it so, and three failed to recognize it as wrong when it was wrong. Six of the children were troubled in a similar way and made the error more than once. Four played a series wrong, thinking it right, and made this mistake from one to four times.

Three distinct methods were used by the reagents, sound, symbol and visual. Combinations of these three were used to some extent.

The symbol method involved the use of syllables, numbers and letters. The visual included a visual image of the keyboard or a key as representing a given tone, the position of the notes on the staff or their relative position when representing tones.

It is readily seen that test I. affords a greater opportunity for the use of the sound method than any other test. Test II. is more favorable for the use of the visual method. In tests III. and IV. there is occasion to use both the sound and visual methods equally.

Table XXI shows the number of children and adults that used each method. The children used the sound method the greatest number of times, twelve, and the adults the sound and visual methods, each twelve times.

The adults used visual memory more than the children, which supports the statement made by Colegrove that "Visual stimuli usually make the strongest appeal to adults, excepting during sleep and repose." There is a great tendency as age increases to use the visual memory. Only in one instance did a child under thirteen use visual imagery, while all the adults, with the exception of one, made more or less use of it. The children used the symbol method to a greater extent than the visual memory. They used it to a greater extent than the adults, probably because in school they are taught to read notes by means of symbols, which would naturally influence them to remember not by the relative position of one note to another, but in terms of another and more familiar system of remembering.

From the table it follows that both the adults and children com-

TABLE XXI
METHODS USED BY CHILDREN AND ADULTS IN LEARNING A SERIES OF MUSICAL NOTES

| Children | | | | | | | | | | | |
|----------|---------|-----|-------|-----|-------|-----|-------|-------|-------|--------|--------|
| I | | II | | III | | IV | | T. T. | | T. No. | |
| No. | Tr. | No. | Tr. | No. | Tr. | No. | Tr. | T. T. | A. T. | T. Tr. | A. Tr. |
| 10 | 198 107 | 10 | 76 41 | 10 | 56 33 | 10 | 58 43 | 388 | | 224 | 40 |
| 6 | 68 41 | | | 3 | 14 11 | 3 | 15 16 | 97 | 8.0 | 68 | 5.6 12 |
| | | 4 | 24 16 | 3 | 27 12 | 2 | 15 11 | 66 | 7.3 | 39 | 4.3 9 |
| 1 | 55 30 | 2 | 18 7 | 2 | 8 6 | 2 | 11 7 | 92 | 13.1 | 50 | 7.1 7 |
| 1 | 15 9 | | | | | 1 | 8 4 | 23 | 11.5 | 13 | 6.5 2 |
| 1 | 20 8 | | | 1 | 2 1 | 1 | 5 3 | 20 | 20.0 | 8 | 8.0 1 |
| 1 | 40 19 | 2 | 13 6 | 1 | 5 3 | 1 | 4 2 | 68 | 13.6 | 35 | 7.0 5 |
| | | | | | | | | 22 | 5.5 | 11 | 2.7 4 |
| Adults | | | | | | | | | | | |
| 11 | 87 34 | 11 | 59 21 | 11 | 48 20 | 11 | 91 39 | 285 | | 114 | 44 |
| 5 | 37 14 | 2 | 4 4 | 4 | 7 5 | 1 | 3 3 | 51 | 4.2 | 26 | 2.1 12 |
| | | 1 | 25 2 | | | 2 | 22 2 | 47 | 15.6 | 4 | 1.3 3 |
| 3 | 36 13 | 5 | 18 10 | 1 | 2 3 | 3 | 37 20 | 93 | 7.7 | 46 | 3.8 12 |
| 2 | 7 3 | 1 | 3 2 | 2 | 8 4 | 2 | 14 8 | 32 | 4.5 | 17 | 2.4 7 |
| 1 | 7 4 | 1 | 1 1 | 2 | 7 5 | 2 | 10 5 | 25 | 4.1 | 15 | 2.5 6 |
| | | 1 | 8 2 | 2 | 24 3 | 1 | 5 1 | 32 | 10.6 | 5 | 1.6 3 |
| | | | | | | | | 5 | 5 | 1 | 1 |

T. = Time in minutes. Tr. = Trials. T.T. = Total time. A.T. = Average time. T.Tr. = Total trials. A.Tr. = Average trials. S. = Sound. Syn. = Symbol. V. = Visual. T.No. = Total number.

pleted test III. in the least time and with the least number of trials, the adults taking less time than the children and fewer trials in either case, although there is no marked difference.

Both adults and children had the poorest record in test I., it taking the children more than twice as long as the adults and three times the number of trials.

Of the three principal methods of learning, the symbol method required the least time for the children and the auditory for the adults.

It will be noticed that the symbol method took the least time for the children and the greatest for the adults, the latter even requiring more time than the former. This is the only instance in which the adult requires more time than the children. It would seem from this that time is lost if we try to fit things into a system with which we are not very familiar, but if we use the system of remembering with which we are most familiar time is gained, and the use of the trial and success method is eliminated.

With both children and adults, this symbol method required the least number of trials, and the visual the greatest, which seems to indicate that we can depend upon our visual memory the least in memory of musical notes, and that when we have a system into which to fit things our power of recall is surer. The children seem to use this method of remembering more than the adults.

Table XXII. represents the number that used different methods, of those who play by ear or do not, and those who play from memory or do not. For convenience I will refer to them as groups a, b, c and d. Three children were placed in group a and seven in group b. It is more than probable that most of those in the latter group could play by ear if they tried, but had never attempted to do so before this experiment. Seven adults were placed in group b and four in group a.

The children in groups a and b used the sound method to the greatest extent. The visual method was not used at all by those in group a, and was made considerable use of by those in group b.

The adults in group a used the sound method the greatest number of times, while those in group b used the visual.

Both children and adults belonging to group b used the visual method more than those of group a.

All the children and eight adults were placed in group c, and the remaining three adults were placed in group d. Group c contains those who play from memory, and group d those who are unable to do so.

Both children and adults in group c used the sound method the

TABLE XXII
METHODS OF LEARNING A SERIES OF MUSICAL NOTES

| | CHILDREN | | | | | | ADULTS | | | | | |
|--------------------------|----------|----|------|----|------|-------|--------|----|------|----|---------|-------|
| | No. | S. | Sym. | V. | Sym. | S. V. | No. | S. | Sym. | V. | S. Sym. | S. V. |
| I. Play by ear, | 3 | 2 | | | | | 7 | 4 | | | 2 | |
| Do not play by ear, | 7 | 4 | | 1 | 1 | | 4 | 1 | | 2 | | 1 |
| Play from memory, | 10 | 6 | | 1 | 1 | | 8 | 4 | | 2 | | |
| Do not play from memory, | 0 | | | | | | 3 | 1 | | 1 | | |
| II. Play by ear, | 3 | | 2 | | | | 7 | 2 | | 3 | 1 | |
| Do not play by ear, | 7 | | 2 | | | | 4 | | 1 | 2 | | 1 |
| Play from memory, | 10 | | 4 | | | 1 | 8 | 2 | | 4 | 1 | |
| Do not play from memory, | 0 | | | | | | 3 | | 1 | 1 | | |
| III. Play by ear, | 3 | 1 | 1 | | | | 7 | 4 | | | 2 | |
| Do not play by ear, | 7 | 2 | 2 | | | | 4 | | | 1 | 1 | |
| Play from memory, | 10 | 3 | 3 | | | 1 | 8 | 4 | | 1 | 2 | |
| Do not play from memory, | 0 | | | | | | 3 | | 1 | 1 | | |
| IV. Play by ear, | 3 | 1 | 1 | | | | 7 | 1 | 1 | 1 | 2 | |
| Do not play by ear, | 7 | 2 | 1 | | | | 3 | 1 | | 2 | | |
| Play from memory, | 10 | 3 | 2 | | | 1 | 8 | 1 | 1 | 2 | | 2 |
| Do not play from memory, | 0 | | | | | | 2 | | | 1 | | 1 |

S. = Sound. Sym. = Symbol. V. = Visual.

greatest number of times and those of group d the least, substituting the visual for it.

From a survey of the whole, it seems that the auditory memory is most essential to musicians, and if they are lacking in this, adults rely upon the visual memory, and the children upon a system with which they are more familiar and into which they can fit the thing to be remembered, for example, the use of the symbols.

As age increases there is a great tendency to use the visual memory. Visual memory is better for the older students because it is employed more by them.

The motor memory is important in committing to memory. In several cases I noticed a movement of the fingers or the lips, and in some cases the symbols were said aloud or were sung.

The usual practice method of musicians seems to be without doubt the best method of learning.

There were many individual peculiarities. One boy took note of the highest tone played, which showed that he reasoned about it, taking less time, fewer trials, and having to hear it the least number of times of all the children. His record too was better than that of many of the adults.

Another child belonged to a family, several of which were very fine musicians. She herself played well, but could not play by ear, as could none of her relatives. It took her fifty-five minutes to complete the first test, thirty trials, and she was obliged to hear it played forty-nine times. Then in order for her to get it, I had to offer suggestions, and call her attention to the relation of one tone to another. One particular tone, a, she couldn't place, and although she played the series twice correctly, she didn't realize it. Finally she became assured that it was correct by comparison, listening intently to the series after having played it herself.

Of the two who could not play the piano, I noticed a similarity in the manner of learning. They were given just enough instruction to enable them to perform the tests. They arranged the notes or tones into three groups, but not by measures, as one would naturally think. A series of tones, one following the other in succession, formed one group, then the repetition of two tones determined the end of a second group, and the third group included the remaining tones. They repeated these groups several times, one more than another, and made no attempt to play from memory until quite sure they could remember it. Both depended on the symbols largely.

One of these two I have just mentioned, f, took twenty-five minutes for the completion of the test, while it took one very proficient in the art of music only a minute. In another test f took

TABLE XXIII.

INDIVIDUAL RECORDS

Children

| Age | Amount of Practice | Play by Ear | Play from Memory | I. | | | II. | | | III. | | | IV. | | |
|--------|--------------------|-------------|------------------|----|------|----|-----|----|------|------|-----|-----|-----|------|----|
| | | | | S. | Sym. | V. | Tr. | S. | Sym. | V. | Tr. | Tr. | S. | Sym. | V. |
| 1. 13 | 2½ yrs. | No | Yes | 1 | | 5 | 3 | | | 1 | 3 | 3 | 1 | | 6 |
| 2. 9 | 1 yr. | Yes | Yes | 1 | | 18 | 11 | 1 | | 1 | 2 | 1 | | 1 | 3 |
| 3. 10 | 7 mo. | No | Yes | 1 | | 15 | 7 | 1 | | | 4 | 2 | 1 | | 5 |
| 4. 11 | 3 yrs. | Yes | Yes | 1 | | 10 | 9 | 1 | | | 6 | 6 | 1 | | 4 |
| 5. 10 | 1½ yrs. | No | Yes | 1 | | 8 | 5 | 1 | | 20 | 8 | | | | 8 |
| 6. 14 | 1 yr. | Yes | Yes | 1 | 1 | 15 | 9 | 1 | | 1 | 4 | 1 | 1 | | 10 |
| 7. 13 | 3 yrs. | No | Yes | | | 55 | 30 | 1 | | 1 | 6 | 5 | | 1 | 5 |
| 8. 13 | 14 mo. | No | Yes | 1 | | 12 | 6 | 1 | | | 4 | 3 | 1 | | 7 |
| 9. 14 | 3 yrs. | No | Yes | 1 | | 20 | 8 | 1 | | 1 | 2 | 1 | 1 | | 8 |
| 10. 11 | 3 mo. | No | Yes | 1 | | 40 | 19 | 1 | | 1 | 5 | 3 | 1 | | 4 |

Adults

| | | | | | | | | | | | | | | | |
|-------|--------|-----|-----|---|---|----|---|---|--|----|---|---|---|---|----|
| a. 21 | little | Yes | Yes | 1 | | 5 | 2 | | | | 4 | 1 | | 1 | 5 |
| b. 21 | little | No | No | 1 | | 7 | 4 | 1 | | | 5 | 3 | | 1 | 17 |
| c. 22 | little | No | Yes | 1 | | 7 | 4 | 1 | | 1 | 2 | 3 | | 1 | 15 |
| d. 21 | none | No | No | 1 | | 25 | 8 | 1 | | 1 | 6 | 2 | 1 | 1 | 5 |
| e. 35 | much | Yes | Yes | 1 | | 2 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 |
| f. 44 | none | No | No | 1 | | 25 | 6 | 1 | | 18 | 1 | | 1 | 1 | 4 |
| g. 21 | little | Yes | Yes | 1 | 1 | 2 | 1 | 1 | | 1 | 2 | 2 | 1 | | 3 |
| h. 21 | much | Yes | Yes | 1 | | 2 | 2 | 1 | | 1 | 2 | 2 | 1 | 1 | 3 |
| i. 22 | much | Yes | Yes | 1 | 1 | 5 | 2 | 1 | | 5 | 2 | | 1 | | 1 |
| j. 21 | some | Yes | Yes | 1 | | 3 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| k. 21 | much | Yes | Yes | | | 4 | 3 | 1 | | 2 | 2 | | 1 | 1 | 3 |

S = Sound. Sym. = Symbols. V. = Visual. T = Time. Tr. = Trials.

eighteen minutes, while the musician required only thirty seconds.

Not age, but training is probably the secret of whatever greater ability the older classes possess. It is true that system is the secret of memory. But system depends on the discovery of distinctions unnoted by the unsystematic, which constitute threads of connection between details. It elevates the association between these details from a mere serial association by contiguity to a simultaneous association in which similarity plays a most important part. The kind of connection that makes all these details one thought may absorb them so that in recall their separate existence is lost. System is the secret of remembering, but also of forgetting whatever it finds inconvenient or unnecessary.

THESIS XIV

INCIDENTAL MEMORY

BY ISABEL WALLACE

Thesis.—Much of what we remember has been learned without conscious effort. During the first few years of his life, when more is learned than during any later period, a large part of the knowledge gained is acquired without volition on the part of the child. Neither does the acquisition without effort cease at the end of these few years.

The data for this thesis were taken in connection with an illustrated lecture on Hiawatha. The lecture was given in the main hall of the normal school, and it was attended by the normal school students and the pupils from the fourth to the eighth grades. Questions were asked which had nothing to do with the lecture itself, but were of things purely incidental.

The questions about the lecture were asked about four weeks after the lecture was delivered. Therefore what was remembered at that time would probably be retained much longer. I received eighty papers from the normal school students, and two hundred and sixteen from the children from the fourth to the eighth grades.

The first question was: "When did Mr. Kempton lecture at the normal school? Give the date and the hour." The normal school students had a much higher per cent. of correct answers than the grade pupils.

The following give an idea of the answers received:

Normal School Pupils:

"December 21, from about half past ten to twelve o'clock. I thought about the lecture for a moment and the remembrance came to me that it was just before the vacation. I thought of the day on which Christmas came, then counted and found that Friday came the twenty-first."

"Mr. Kempton lectured on Hiawatha the Friday before the Christmas vacation—Dec. 21, 1906. The time was 10:30 in the morning. I remembered the day because Howard was married on Tuesday the twenty-fifth and the Friday before was therefore the twenty-first."

"Mr. Kempton lectured on Hiawatha Dec. 23, 1906. The lecture was on Friday and came at 10:40 A. M.

"He gave it on Friday afternoon between four and five. I re-

member it was about five because I did not have to wait long after the lecture until supper."

"It was Wednesday before the Thanksgiving recess. I remember because we went home that day."

An eighth grade boy: "Mr. Kempton lectured Dec. 28, 1906, at half past two in the afternoon."

A fourth grade boy: "Before Christmas."

The normal school pupils acknowledged that they used reason as well as memory in answering questions. They thought first that the lecture came before a vacation and then they calculated the date. Some did not think of the right vacation, while one thought that supper rather than dinner followed the lecture. The answers of the normal and the eighth grade pupils include more details than the answers of the children in the lower grades.

The second question was: "What color was his suit?"

The normal school students:

"His clothes were of dark mixed goods."

"I think his clothes were black."

An eighth grade boy: "His suit was blue."

A sixth grade girl: "His suit was gray."

A fourth grade boy: "Dark."

Several said that they could not see the color of his suit because the lights were turned out and some of the reasons for the answers were peculiar. For instance, "He wore a dark suit such as all men wear." "He has always worn black." These indicate that some relied on their previous knowledge and not upon their memory of the particular individual and day.

The third question was: "From what did he read?"

The normal school pupils:

"He read from a book which had limp covers, for he folded one side of the book back."

"He read from a book about three fourths of an inch thick."

"He read from small sized note paper."

An eighth grade girl: "He read from a book."

A sixth grade boy: "He read from the poem."

A fifth grade girl: "He read out of a little book of Longfellow's poems."

The fourth question was: "Who managed the lantern?"

The normal school students:

"A lady managed the lantern."

"The man who managed the lantern has acted in the same capacity here before."

"Mrs. Kempton managed the lantern."

A boy in the fifth grade: "Mrs. Kempton."

A fifth grade boy: "Mr. Alexander managed the lantern."

A fourth grade boy: "Mr. Thompson managed the lantern."

A fourth grade girl: "The minister from the C. C. church."

The per cent. of the sixth grade children who were able to answer the question was very low. (The children in this grade had been told by their teacher not to look around the hall.)

The fifth question was: "Describe the clothing of the person who managed the lantern."

The normal school pupils:

"She had on a light waist and a black skirt."

"She wore a white waist and a dark skirt."

"A striped waist and a dark skirt."

"A light cape and no hat."

An eighth grade boy: "A light waist and a blue skirt."

Another: "A plaid waist and a dark skirt."

A sixth grade girl: "She wore a gray suit."

A sixth grade boy: "He had pants, vest, jacket, necktie, collar and watch."

A fourth grade boy: "She had pretty clothes on."

There is a great variety in the answers to this question because the person stood at the back of the hall where she was out of the range of vision of most of the children. Unless they saw her enter the hall, they were obliged to turn around to see her. Owing to the fact that the hall was darkened, it was necessarily difficult to obtain an idea of the clothing. Many of the answers are so general that they would apply even if the pupil had not seen Mrs. Kempton.

The sixth question was: "Tell me about any change in the lighting of the hall."

The normal school pupils:

"The hall was darkened by the shutters over all the windows. During the first part of the lecture, the electric lights were on. When Mr. Kempton was ready for the pictures, the lights were turned out. They were on again for the audience to go out."

"When we went in, the hall was as usual. Then the dark curtains were let down. After Mr. Kempton had read a few moments, the lights were turned on until he was ready to show the pictures, and then they were turned off again. After the pictures, the curtains were raised."

An eighth grade girl: "The curtains were pulled down and the doors closed."

A seventh grade girl: "It changed from red to green."

A seventh grade boy: "The curtains were drawn and the electric lights lighted."

A sixth grade girl: "The lights were put out."

A fifth grade girl: "Sometimes it was dark, at other times light."

A fifth grade boy: "Darkened."

The girl who answered that it changed from red to green must have been thinking of something entirely different. It was noticeable that the normal school pupils had a knowledge of the order in the changes made in the lighting. This knowledge was not contained in the answers from the lower grades, but almost everyone knew that the hall was darkened during the time when the pictures were shown.

The seventh question was: "Tell anything you can about Mr. Thompson (principal of the normal school) during the lecture." The normal school pupils:

"Mr. Thompson introduced the speaker, going upon the platform: He also helped to pull the curtains."

"Mr. Thompson helped lower the curtains and introduced Mr. Kempton. After it was over, he raised some of the curtains. He asked Mr. Alexander if he had anything to say to the Edgerly pupils."

An eighth grade boy: "He pronounced the name of Hiawatha."

Another: "Mr. Thompson was quiet and sat near the stage."

Eighth grade girl: "Mr. Thompson introduced Mr. Kempton."

A seventh grade boy: "He spoke."

The eighth question was: "Tell me anything you can about Mr. Alexander during the lecture."

The normal school pupils:

"Mr. Alexander had charge of the pupils from the Edgerly. He gave an announcement to the Edgerly School children at the close that school would begin again after the Christmas vacation."

"Mr. Alexander stood in the back of the room watching the children and when they were making a disturbance he spoke to them quietly. I remember that he watched a particular group of boys and spoke to them."

A girl in the eighth grade: "He placed the people in their seats."

Eighth grade boys: "Mr. Alexander was at the head of it all."

"Mr. Alexander was a chairman."

A seventh grade girl: "He saw that nobody was rude."

A sixth grade boy: "He helped run the machine."

The children seemed better able to answer this question than the previous one. They are more familiar with Mr. Alexander and

are more accustomed to watch him because he is principal of the Edgerly School.

The ninth question was: "What kind of a day was it?"

The normal school pupils:

"It was a dark, rainy day. It was very slushy. I remembered that because I found it hard walking when coming to school."
"Pleasant and sunny and quite cold." "A misty day. I remember because I was uncertain about taking an umbrella, but finally sent it back to my room. Also very slippery and slushy under foot, for one of the girls fell down and got her coat wet."

An eighth grade boy: "It was slippery."

An eighth grade girl: "It was dark and damp."

A seventh grade girl: "It was muggy."

A fifth grade boy: "It was rainy."

A fourth grade girl: "It was cold."

Any of the answers could be applied to this particular day, as the weather was decidedly unsettled. It is difficult therefore to decide whether the pupils actually remembered the conditions of the weather on this particular day or not.

The tenth question was: "Was there anything except the lecture?"

The normal school pupils:

"The children and the normal school students sang Christmas carols before the lecture. Miss Perry gave out the names of the songs and played the accompaniments."

An eighth grade boy: "There were colored pictures."

A sixth grade girl: "There were moving pictures."

A fourth grade girl: "We sang Christmas songs."

The eleventh question was: "Did anyone come in the front door during the lecture?"

The normal school pupils:

"Dr. Chalmers and a few others came in during the lecture."
"Two men and some ladies came in the front door."

An eighth grade boy: "Ernest Seton Thompson came in the front door."

A fifth grade boy: "Dr. Chalmers and Mr. Kratzer came in during the lecture."

When anyone came in the front door, the contrast between the darkened hall and the light corridor attracted attention. This is probably the reason that many knew that some people came in during the lecture. Those who were able to mention names had definite knowledge. The boy who said that Ernest Seton Thompson came in the front door may have referred to Principal Thompson.

The twelfth question was: "Were there any decorations in the hall and what was there on the platform?"

The normal school pupils:

"There was a white screen, a drawing table, a chair and a lantern on the stage."

The hall was decorated with autumn leaves."

"There were the decorations from the last party."

(These last two show that the individuals were thinking of some previous lecture.)

"Across the front of the platform a large white curtain was stretched. To the right of the curtain was a drawing table used by Mr. Kempton to rest his book and his light upon. There was a dark red curtain upon the platform when the moving pictures were shown. There was a fern on a stand, a desk and a chair."

(The curtain was white and this person must have been thinking of some other occasion.)

A seventh grade girl: "A chair and a glass of water on a little stand."

(She must have had in mind another lecture where the lecturer had a glass of water as there was none on the platform in this case.)

In preparing the tables those who acknowledged that they knew nothing about the questions were grouped with those whose knowledge was clearly incorrect. The other papers were grouped together as having knowledge of the question.

As the answers cited in this paper indicate, the normal school students have answered at greater length than the pupils in the grades. They have given more details and many gave accounts of the ways in which they remembered. The greater command of language enabled the normal school pupils to express themselves more fluently and with a greater degree of accuracy. The pupils in the higher grades have given more details than those in the lower ones.

Reason as well as memory was used in answering some of the questions. This was especially true of the normal school pupils and to some extent of those of the grades. The questions where reason was unquestionably used by many are the first, for many acknowledged that they calculated in order to find the date; the sixth, because in order to show stereopticon views we know that the hall must be darkened and also the twelfth to some extent, because there must have been something on which the lecturer could place his books or papers.

Previous knowledge was used in the second, where an answer which could be applied to any man was given; in the fourth, for many knew that Mrs. Kempton often manages the lantern for Mr.

Kempton; in the fifth where general answers were given; in the sixth, for many know that the hall is always darkened for a stereopticon lecture; in the seventh because many, especially normal school students, know that Mr. Thompson usually introduces the speaker; and in the eighth because Mr. Alexander usually has charge of the pupils at a lecture.

Some used direct association as in answering the question, "From what did he read?" Some evidently answered from a desire to write something in spite of the fact that they had no knowledge of the question.

The statistical result of the study is presented in tables XXIV. and XXV., which show the per cent. of boys and of girls of each school grade, and the per cent. of normal school students, whose answers to each question showed knowledge of the fact.

The question which was answered with the greatest degree of accuracy by all the grades was the third, and next came the sixth and ninth. The questions which were answered better by the lower grades than the higher were the third, the tenth, and the eleventh. There is no regular decrease according to grades in any of the questions. Girls are seen to have more ability to remember incidentally than boys.

| Normal | 8th Grade | 7th Grade | 6th Grade | 5th Grade | 4th Grade |
|------------------|-------------------|------------------|------------------|------------------|------------------|
| 79 $\frac{1}{8}$ | 67 $\frac{7}{12}$ | 64 $\frac{1}{4}$ | 53 $\frac{1}{8}$ | 65 $\frac{1}{8}$ | 61 $\frac{2}{3}$ |

This table shows the final total averages and it indicates that there is no very marked difference in the per cents. The per cent. of the normal school pupils is the highest, but the decrease in passing to lower grades is not regular. Considering that the normal school pupils and the higher grades have greater ability to reason and also a greater amount of knowledge upon which to rely, they show no remarkable gain in the amount remembered incidentally. The differences in incidental memory seem to be due to natural individual differences.

For instance one person of my acquaintance has a remarkable power to remember the clothing of individuals. This person is able at the close of the day to describe the clothing of every teacher, and of many of her acquaintances. Seemingly after a mere glance she will describe in detail the clothing of a person whom she meets on the street. In marked contrast to this person is another who seldom notices a person's clothing unless something unusual attracts. This latter person is more apt to notice what a person says than what he wears.

Another acquaintance can tell many of the peculiar habits of her associates. Various attitudes, tricks of expression, favorite phrases, and different mannerisms are associated with her mental images of the persons with whom she comes in contact. She is able to tell just what certain persons have done during the day and the attitudes they have assumed under various conditions.

One person acknowledges that he is remarkably defective along the line of incidental memory. He can drive all day and not be able

TABLE XXIV

Boys

| | Grades | | | | |
|------------------------------|--------|-----|-----|-----|----|
| | 8 | 7 | 6 | 5 | 4 |
| Number of papers, | 25 | 25 | 19 | 17 | 19 |
| Question I. | | | | | |
| Per cent. with knowledge, | 16 | 0 | 5 | 0 | 10 |
| Per cent. with no knowledge, | 84 | 100 | 95 | 100 | 90 |
| Question II. | | | | | |
| Per cent. with knowledge, | 88 | 72 | 74 | 88 | 68 |
| Per cent. with no knowledge, | 12 | 28 | 26 | 12 | 32 |
| Question III. | | | | | |
| Per cent. with knowledge, | 96 | 92 | 100 | 100 | 84 |
| Per cent. with no knowledge, | 4 | 8 | 0 | 0 | 16 |
| Question IV. | | | | | |
| Per cent. with knowledge, | 84 | 80 | 68 | 77 | 63 |
| Per cent. with no knowledge, | 16 | 20 | 32 | 23 | 37 |
| Question V. | | | | | |
| Per cent. with knowledge, | 52 | 28 | 32 | 47 | 38 |
| Per cent. with no knowledge, | 48 | 72 | 68 | 53 | 62 |
| Question VI. | | | | | |
| Per cent. with knowledge, | 76 | 68 | 84 | 71 | 63 |
| Per cent. with no knowledge, | 24 | 32 | 16 | 29 | 37 |
| Question VII. | | | | | |
| Per cent. with knowledge, | 56 | 44 | 63 | 47 | 48 |
| Per cent. with no knowledge, | 44 | 56 | 37 | 53 | 52 |
| Question VIII. | | | | | |
| Per cent. with knowledge, | 60 | 64 | 43 | 59 | 63 |
| Per cent. with no knowledge, | 40 | 36 | 57 | 41 | 37 |
| Question IX. | | | | | |
| Per cent. with knowledge, | 74 | 84 | 95 | 100 | 95 |
| Per cent. with no knowledge, | 26 | 16 | 5 | 0 | 5 |
| Question X. | | | | | |
| Per cent. with knowledge, | 32 | 48 | 43 | 53 | 63 |
| Per cent. with no knowledge, | 68 | 52 | 57 | 47 | 37 |
| Question XI. | | | | | |
| Per cent. with knowledge, | 80 | 68 | 43 | 83 | 74 |
| Per cent. with no knowledge, | 20 | 32 | 57 | 17 | 26 |
| Question XII. | | | | | |
| Per cent. with knowledge, | 60 | 40 | 48 | 48 | 37 |
| Per cent. with no knowledge, | 40 | 60 | 52 | 52 | 63 |

to tell the color of the horse! He even was so unfamiliar with his daughter's best coat that he sent it off in a missionary box. These are a few instances of the remarkable differences in the memories of individuals.

In a study supplementary to the one about the lecture, quotations were put upon the blackboard for the normal school students and for the pupils in the seventh and eighth grades. The quotations were on blackboards which were seen by the pupils every day. Nothing

TABLE XXV

| | <i>Girls.</i> | | | | | Normal School |
|------------------------------|---------------|----|-------------|-----|-----|------------------|
| | 8 | 7 | Grades 6 | 5 | 4 | |
| Number of papers, | 21 | 32 | 26 | 17 | 15 | 84 |
| Question I. | | | | | | |
| Per cent. with knowledge, | 53 | 3 | 0 | 6 | 6 | 60 |
| Per cent. with no knowledge, | 47 | 97 | 100 | 94 | 94 | 40 |
| Question II. | | | | | | |
| Per cent. with knowledge, | 95 | 88 | 63 | 88 | 87 | 87 |
| Per cent. with no knowledge, | 5 | 12 | 27 | 12 | 13 | 13 |
| Question III. | | | | | | |
| Per cent. with knowledge, | 100 | 97 | 89 | 100 | 100 | 86 |
| Per cent. with no knowledge, | 0 | 3 | 11 | 0 | 0 | 14 |
| Question IV. | | | | | | |
| Per cent. with knowledge, | 95 | 78 | 43 | 54 | 60 | 84 |
| Per cent. with no knowledge, | 5 | 22 | 57 | 46 | 40 | 16 |
| Question V. | | | | | | |
| Per cent. with knowledge, | 90 | 63 | 34 | 66 | 20 | 59 |
| Per cent. with no knowledge, | 10 | 37 | 66 | 34 | 80 | 41 |
| Question VI. | | | | | | |
| Per cent. with knowledge, | 95 | 94 | 96 | 94 | 100 | 95 |
| Per cent. with no knowledge, | 5 | 6 | 4 | 6 | 0 | 5 |
| Question VII. | | | | | | |
| Per cent. with knowledge, | 72 | 38 | 27 | 59 | 74 | 79 |
| Per cent. with no knowledge, | 28 | 62 | 73 | 41 | 26 | 21 |
| Question VIII. | | | | | | |
| Per cent. with knowledge, | 74 | 53 | 62 | 59 | 47 | 89 |
| Per cent. with no knowledge, | 26 | 47 | 38 | 41 | 53 | 11 |
| Question IX. | | | | | | |
| Per cent. with knowledge, | 95 | 91 | 96 | 88 | 94 | 100 |
| Per cent. with no knowledge, | 5 | 9 | 4 | 12 | 6 | |
| Question X. | | | | | | |
| Per cent. with knowledge, | 43 | 66 | 85 | 59 | 74 | 85 |
| Per cent. with no knowledge, | 57 | 34 | 15 | 41 | 26 | 15 |
| Question XI. | | | | | | |
| Per cent. with knowledge, | 48 | 78 | 69 | 71 | 74 | 69 |
| Per cent. with no knowledge, | 52 | 22 | 31 | 29 | 26 | 31 |
| Question XII. | | | | | | |
| Per cent. with knowledge, | 32 | 75 | 44 | 18 | 21 | 57 |
| Per cent. with no knowledge, | 68 | 25 | 56 | 82 | 79 | 43 |

was said about the quotations and no questions in regard to them were asked. They were left upon the boards about four weeks, after which they were erased and the pupils were requested to write them from memory.

The quotations were chosen with reference to the age and ability of the pupils. The one for the normal school pupils was:

"Character is higher than intellect; a great soul will be strong to live as well as to think." *Emerson—The American Scholar.*

That for the eighth grade was:

"The deed I intend is great, but what as yet I know not." *Ovid.*

That for the seventh grade:

"Be merry all, be merry all,
With holly dress the festive hall,
Prepare the song, the feast, the dance,
To welcome merry Christmas."

Spencer—Joys of Christmas.

Although the last quotation is longer than the previous one, on account of the rhyme and rhythm it is more easily learned.

From the normal school pupils I received seventy-seven papers, from the eighth grade twenty-nine, and from the seventh grade forty-three. Very few had the quotations absolutely correct. The highest per cent., fourteen, was found in the eighth grade; the next highest, seven, in the seventh grade; and the lowest, six, among the normal school students.

The highest per cent., eighteen, who gave the idea of the quotation, was found among the normal students; the next highest, fourteen, in the eighth grade, and the lowest, four, in the seventh grade. Ideas, not words, appealed to the older people.

Some gave quotations which they had seen elsewhere. Many of the normal school students told just where the quotation was written.

This is a mechanical memory by which one remembers the exact position of a word in the dictionary or of a paragraph upon a printed page.

Although much that might be remembered incidentally might and would prove of value, the power or ability to discriminate that which could be used later is most worthy of cultivation.

THESIS XV

CHILDREN'S IDEAS OF RIGHT AND WRONG

BY FANNIE G. STEARNS

Thesis.—Having been placed in close contact with children during the last two years, I have become interested to know what the child's conception of right and wrong might be. In order to make a more intelligent study of the subject, I decided that by questioning children of grades one and two, five and six and nine, I might gain some insight into their opinions regarding right and wrong.

The questions asked of each child were these:

What is the worst thing a girl can do?

Why do you consider this wrong?

What is the worst thing a boy can do?

Why do you consider this wrong?

In all, over three hundred and fifty papers were received, and in answering the above questions the children gave their ideas concerning what they believed to be wrong for their own and the opposite sex. In some cases, particularly with the younger children, the same faults were mentioned for both sexes, but those who did this were in the minority.

The answers were carefully tabulated according to age and grade, and those having something in common, such as drinking, smoking, swearing, lying and cheating were placed in groups. The grouping according to age was as follows—from five to seven—from ten to twelve—and from thirteen to sixteen years of age. For convenience these periods will be considered as childhood—intermediate years—and adolescence.

The following are answers typical of each period. A boy six years of age said: "The worst thing a girl can do is to run away because mother would call and call and the girl wouldn't hear and mother would cry. The worst thing a boy can do is to set the house on fire because some one might not know and be burned up." A boy eleven years old wrote: "Lying is the worst thing a girl can do, because it is wrong anyway. To smoke or swear is the worst thing a boy can do because gentlemen never smoke or swear." A girl of fifteen years wrote: "The worst thing a girl can do is to disobey her parents. If a girl does just the opposite to what her

parents want her to, she will most likely get into bad company and will be out on the streets acting rude and disorderly."

The principal faults named were classified in five groups. The total number of answers included in these groups was 513 and those mentioned came in this order: bad habits, including drinking, smoking and swearing, 168; disobedience, 102; having low social habits, 83; and stealing, 73.

Deceit was considered by girls as the worst fault for their own sex, while for the opposite sex they named bad habits, drinking, smoking and swearing. These two are doubtless the most common faults in each. Girls do not consider deceit a very bad fault for boys and place it fifth in the list for them. It is generally acknowledged that girls are more deceitful than boys and it is also conceded that it is the worst fault in women. That deceit is so prominent in their minds as to be avoided may be due in part to the fact that their elders warn them against it continually, and in part to natural tendency.

Girls name low social habits and disobedience as the next worst fault to be avoided by themselves, while for boys they put them in this order—disobedience and low social habits. That girls do not mention low social habits as being as bad for boys as for themselves is probably because this vice in boys is not emphasized so much by older people.

Girls place drinking, smoking and swearing as the fourth worst fault for themselves. As a rule they do not indulge in these vices, but when we do find a girl who has stooped so low we are stricken with horror. It is the unusual that surprises us most and so girls even though they seldom see these vices in their own sex are impressed with the fact that they are to be dreaded in girls.

The girls believed that stealing was the fourth worst fault for boys but placed it fifth for themselves.

We will now consider what vices are worst according to the opinions of the boys. They say that drinking, smoking and swearing are the worst for both boys and girls. In this they seem to make no distinction as to sex. Boys say that the second worst fault for themselves is cheating while for girls it is deceit.

Stealing seems to hold a very prominent place in the opinion of boys. They place it second for themselves and third for girls, while girls place it fifth for themselves and fourth for boys.

Vandalism stands as the third vice boys consider for themselves. It is scarcely mentioned for girls. Evidently the boys think of this as belonging only to themselves. The term vandalism is used to include fighting, hurting people and defacing property. It may be that

boys do consider this as the third worst vice for themselves, but I think it was given this high position because of the stress school authorities had laid on defacing property just previous to the writing of these papers by the children. Many papers showed plainly the influence of this recent experience.

The following answer is typical of many given in a school where this vice had been particularly emphasized. "The worst thing a boy can do is to go to school and then deface the building by cutting it and marking it up. I consider this a wrong thing because the city gave the children the free use of the school and the children ought to treat the city in the way the city treated the children."

According to boys, disobedience is equally bad for both sexes while they consider deceit worse for girls than for themselves.

We found that girls gave low social habits a prominent place as something to be avoided by both their own and the opposite sex. On the other hand boys place it at the end of the list for boys and girls. That boys give it this obscure place is probably due to the fact that their attention has been called to it less than is the case with girls.

We find that, as to the three periods of development, drinking, smoking and swearing was denounced by the girls as being a worse vice in intermediate years than in the two other periods. Their beliefs during childhood and adolescence regarding this vice are about the same. Girls from five to seven years of age do not realize the meaning of these habits. They see older boys and men smoking and it means practically nothing to them. They see an intoxicated person and the sight serves merely as an amusement. When they have reached adolescence, other vices which affect them more closely, seem worse.

The conception of drinking, smoking and swearing as the worst things a child can do reaches its climax in the opinion of boys from the ages of ten to twelve years. During childhood it is less than half as prominent and in adolescence it ranks much lower than during intermediate years. This may be due to the fact that during childhood it does not generally enter into his experience. As he reaches intermediate years he is easily influenced by what he sees and hears and it seems an astounding wrong and a vice to be abhorred. Later the experience becomes common among his friends. He desires to become a man and considers that the outward signs make this an enviable condition. This is particularly true of smoking and swearing. The commonest of these habits is smoking and so it no longer seems wrong or a fault, but an incident, an event in becoming a man.

Disobedience as the worst fault in the child's opinion is most

prominent from five to seven years for both boys and girls. Little girls however think it worse than little boys. And have we not found it true in our experience with small children that girls rather than boys think it a greater sin to disobey? This fault holds rather an insignificant place during intermediate years and adolescence, and is practically the same for both boys and girls.

Girls during the intermediate period do not consider being deceitful a bad fault and at this age many use deceit when they think it is for their advantage. In childhood they consider lying worse than they do in intermediate years. This may be explained by the fact that small children probably consider lying the same as disobedience.

Deceit for boys is believed to be worse by themselves during adolescence. At this age they seem to realize that a person whose word can not be relied upon will not get along in the world for no one will place sufficient faith in him even to give him work.

When we consider the five worst faults for boys and girls of all ages we find that girls believed that low social habits was worst for themselves. The figures show that in childhood they consider this worst. That this fault should be most prominent during childhood in the opinion of girls seems almost impossible, but it is to be explained in this way. Of all the faults mentioned by girls from five to seven years of age running away was considered the worst. Running away was included in my classification under the general term social habits, hence the high place that low social habits holds in the minds of girls from five to seven.

This having been disposed of we may safely say that low social habits as the term is commonly used stand highest as that to be avoided in the opinion of girls during adolescence rather than in childhood or intermediate years. With boys this stood highest during intermediate years and lowest during adolescence.

Stealing was not mentioned at all by girls from five to seven and stood highest from thirteen to sixteen years. That it is highest during adolescence seems to show that at that period in life girls come to realize what it means to be looked upon as a thief. Stealing is looked upon by boys too as being worst during adolescence.

Girls from five to seven believe the vice to be guarded against most is disobedience, from ten to twelve bad habits—drinking, smoking and swearing and from thirteen to sixteen deceit. With the exception of bad habits, considered worst during intermediate years, the faults that they named as being worst for themselves are probably the ones they yield to most.

Boys from five to seven believe disobedience to be the worst

vice, from ten to twelve and from thirteen to sixteen bad habits. Boys from thirteen to sixteen give stealing a very prominent place also. I believe that boys, too, indulge most largely in those vices which they say they believe to be the worst for themselves.

As to the reasons why the things named were worst the answers given seemed to divide themselves into four classes, namely, the social, the law abiding, the character and the punishment groups.

From the results obtained by a comparison of the four groups it seems that the largest number of children, of all ages and both sexes together, are prevented from wrong doing by the fact that if they are guilty of certain faults it will prevent them from developing a good character. Many answers in this group gave the idea that certain acts were wrong for children not so much because of the doing of the single act but because of what it would lead to.

A boy twelve years of age wrote: "The worst thing a boy can do is to steal. I consider this a very bad beginning for a small boy." While a girl of fourteen years says: "I think the worst thing a girl can do is to cheat. A person who cheats once will cheat every time they get the chance."

For children, of all ages and both sexes counted together, those motives classed as law-abiding were very nearly as prominent. In this division were included reverence, home training, wrong and the Ten Commandments. Typical answers grouped under each of these particular headings may prove of interest here.

"I think the worst thing a boy can do is to say or do anything against his mother because your mother is the best friend you have. If anything goes wrong with you she will protect you."

"The worst thing a boy could do would be to deliberately rob any person. That boy ought to be fined and imprisoned because a boy who has had a proper training at home ought to know better."

"The worst thing a boy can do is to go with girls and swear. I consider this wrong because girls are very giddy and swearing is very wrong."

A girl of twelve years writes: "The worst thing a girl can do is to swear because it is taking the name of God in vain. The worst thing a boy can do is to steal because it says in the Bible "Thou shalt not steal."

Next in prominence was the social group which includes public opinion, reputation, approval and desire to please. A girl of thirteen years influenced in her moral ideas by public opinion wrote: "I think the worst thing a girl can do is to go around with a tough crowd for it will make her name quite known and she will have to work very hard to enter any decent society." A boy of

fourteen years of age believed that the worst thing a boy could do was to get into bad company because it would give him a bad reputation.

A little girl influenced in her opinion of what is wrong by the approval of older people said she thought the worst thing a girl could do was not to be good because mama wouldn't like her.

The following answer might be classed under desire for approval or desire to please. "The worst thing a boy or girl can do is to whisper in school because teacher don't want you to."

Although it has been stated that the groups showing the motives most prominent, in the minds of children of all ages and both sexes together, were first—character, second—law-abiding, third—social and fourth punishment, it may also be stated that the first three were about equally prominent while the fourth ranked far below.

We will now separate boys from girls, still massing all ages together, and compare the motives expressed by boys and by girls. Girls are influenced first by the social motives while with boys obedience to law is the first requisite. I believe that both have named the things which do influence them most in their actions. Who can show us the person who has observed children widely and who will not say that girls are influenced in their actions first by what people will think of them, while boys are influenced most by whether they are keeping within the law or not, not merely law as laid down by our courts but by the moral law.

With boys social motives come second while with girls law abiding motives hold second place.

As to the advantage of possessing a good character both boys and girls agree and both would strive for it equally. This is probably the result of moral training together with their innate goodness. In this we in part agree with John Locke, the English philosopher, who said that people are naturally good and that they develop other than in the right way owing to contact with vice in the world.

Punishment as a prevention of wrong doing holds an equally small place with both sexes.

We will now see what place these four motives hold in the minds of children during childhood, intermediate years and adolescence.

The motives placed in the social group are most prominent in childhood and least prominent during intermediate years. They stand very much higher in girls than in boys during this period. We found that girls of all ages placed these higher than boys. Many people believe this is due to the fact that girls are trained in such a way as to make them more sensitive to public opinion. But that

during childhood the social motives stand 67 per cent. in girls and only 19 per cent. in boys points to the conclusion that girls are naturally more sensitive than boys in this respect, for I do not believe that up to the time boys and girls are five years old their training in this respect has been any different.

In girls the law-abiding motives are equally prominent in childhood and intermediate years and less so in adolescence. That is, girls come to realize in adolescence the importance of having a good character. By girls punishment as a preventative of wrong doing was scarcely mentioned either in childhood or adolescence but was most prominent during intermediate years. This may be due to the fact that parents think they find more occasion to punish children of this age and act according to their belief. It may be explained in part also by the fact that to children of this age immediate punishment for their sins seems worse than some consequence that although it might not happen for a longer time would really be more disastrous and far reaching in the end. This would be realized by children in adolescence while in early childhood they think it much worse not to be liked than to be punished.

In regard to the ages when conformity to law seems most necessary, boys and girls agree very closely. Regarding punishment the prominence in the different ages agrees for both sexes. In childhood, however, boys place it higher than girls.

During childhood, intermediate years and adolescence girls are kept from wrong doing by the opinion of others, conformity to stated rules and the necessity of having a good character, respectively. During the same periods of life boys are guided by conformity to stated rules during the first two and in the third by the necessity of possessing a good character.

In conclusion let us see how parents and teachers may take advantage of the child's ideals and appeal to him along the line of his own motives for avoiding wrong. Justice is the primary virtue of all races and not until the coming of Christ did the world ever hold the conception of mercy and not sacrifice. So to a child justice is the primary virtue and the great ideal. To his mind it means doing according to his reasoning. So if we can meet the child on his own moral ground, win him through his own conceptions, encourage the good motive and thwart the low motive we have won our child.

Let us first consider his childhood. The motive and ideal here is naturally simple and easily reached. We found that girls from five to seven years of age are influenced most easily through the social motives—desire to please and approval.

When the children enter the school for the first time we must

influence them in such a way that they will wish to please us. In order to do this we must win their affection. We can express our approval of their little efforts to do right and teach them the kind of reputation we wish them to covet by means of stories such as Joseph and other Bible heroes and Baucis and Philemon.

The teacher whose pupil said it was wrong to whisper because teacher don't want you to, had appealed in some way to a strong motive in the little one.

The little boys are also strongly influenced by obedience to law be that law ever so simple. The boy who said he must not drop chalk because it was wrong was loyal to the teacher's law. So it would seem that they are willing to take our superior knowledge for granted and abide by our laws and advice.

Next we will consider the intermediate period, for all children must pass through the three stages—childhood, intermediate years and adolescence. The motive appealing to girls during intermediate years has changed to the law abiding although the social motives still remain strong. The girl twelve years of age who says it is wrong to swear because it is taking God's name in vain has grown some since the period when personal approval was her motive for avoiding the wrong act. In a few years more she will be influenced by all the new feelings and ideals of adolescence and we must recognize the bridge between the two and not swing too far either way. We have a right to appeal to our girls in the fifth and sixth grades by examples of the lives of noble men and women who have sacrificed themselves to obey the higher law of conscience or the voice of God. Stories from the Greeks and Romans may prove invaluable in these grades.

The boys and girls of this intermediate period agree, so that any well founded system of law in which the children have some part, that is recognized as universal law, will appeal strongly to both sexes.

Now we come to the great period of change known to the psychologist as adolescence. It is the most trying period of a child's life. Everything changes—body, mind and spirit—and we find our girls and boys leaving previous ideals behind and reaching toward the great ideal of manhood and womanhood. In both sexes the strong motive is character building or an appreciation of the great dignity and worth of life. Here we may in our eighth and ninth grades and in the high school introduce simple studies in "Every-day Ethics."

It is as though a plant grew up to the light and then found no food in its welcome rays. The children are seeking after character and they need more than example, they need instruction in the fundamentals of good character. The girl who thought it was wrong to cheat because it led to the habit of cheating was on the

right road. The teacher could easily influence that girl along other lines by appealing to the truth she had discovered for herself that one wrong act leads to another or that one step in the wrong direction makes it easier to take the next.

TABLE XXVI

THE WORST FAULT, ACCORDING TO GIRLS

The numbers opposite each fault mentioned at the left give the per cent. of girls, of each age, who condemn this fault most strongly in girls and in boys.

| AGE | Worst Fault of Girls | | | | Worst Fault of Boys | | | |
|---------------------------------|----------------------|-------|-------|-------|---------------------|-------|-------|-------|
| | 5-7 | 10-12 | 13-16 | Total | 5-7 | 10-12 | 13-16 | Total |
| <i>Number of girls judging,</i> | 33 | 46 | 104 | 183 | 33 | 47 | 38 | 118 |
| Drink, | | | 2 | 1 | | 8 | 10 | 7 |
| Smoke, | | 6 | 1 | 2 | | | | |
| Swear, | 9 | 30 | 5 | 12 | 19 | 40 | 8 | 24 |
| Group total, | 9 | 36 | 8 | 15 | 19 | 48 | 18 | 31 |
| Form bad habits, | | | 4 | 2 | | | 10 | 4 |
| Keep bad company, | | 4 | 2 | 2 | | | 3 | 1 |
| Be bold, | | | 2 | 1 | | | | |
| Be out late, | | 2 | 4 | 3 | | | | |
| Run away, | 28 | | | 5 | 22 | 2 | 5 | 8 |
| Kiss a boy, | | 2 | | 1 | | | | |
| Be untidy, | | 2 | 3 | 2 | | | | |
| Be impolite, | | | 1 | 1 | | | | |
| Be saucy, | | 16 | 6 | 7 | | 2 | 7 | 4 |
| Group total, | 28 | 26 | 22 | 24 | 22 | 4 | 25 | 16 |
| Be deceitful, | | 2 | 4 | 3 | | | | |
| Lie, | 16 | 12 | 19 | 16 | 9 | | 3 | 4 |
| Cheat, | | 4 | 12 | 8 | | | 7 | 2 |
| Group total, | 16 | 18 | 35 | 28 | 9 | | 10 | 6 |
| Steal, | | 2 | 15 | 10 | | 15 | 29 | 15 |
| Group total, | | 2 | 15 | 10 | | 15 | 29 | 15 |
| Torture, | | | 1 | 1 | | | | |
| Commit murder, | | | 1 | 1 | | | 3 | 1 |
| Take animal life, | | | | | | 2 | | 1 |
| Deface property, | | | 1 | 1 | | | | |
| Slap people, | 3 | | | 1 | 3 | | | 1 |
| Throw dirt, | 3 | | | 1 | 3 | | | 1 |
| Fight, | | | | | | 15 | | 5 |
| Group total, | 6 | | 3 | 5 | 6 | 17 | 3 | 9 |
| Disobedience, | 19 | 6 | 9 | 10 | 22 | 8 | 5 | 11 |
| Disrespect to parents, | | | 4 | 2 | | | 7 | 2 |
| Tease mother, | 3 | | | 1 | | | | |
| Whisper, | 19 | | | 3 | 19 | | | 5 |
| Drop crayons, | 3 | | | 1 | 6 | | | 2 |
| Play truant, | | | | | | 6 | | 2 |
| Group total, | 44 | 6 | 13 | 17 | 47 | 14 | 12 | 22 |
| Lose self respect, | | | 1 | 1 | | | | |
| Sin, | | 2 | | 1 | | | | |
| Jump rope, | | 4 | | 1 | | | | |

TABLE XXVII

THE WORST FAULT, ACCORDING TO BOYS

The numbers opposite each fault mentioned at the left give the per cent. of boys, at each age, who condemn this fault most strongly in boys and in girls.

| AGE | Worst Fault of Boys | | | | Worst Fault of Girls | | | |
|--------------------------------|---------------------|-------|-------|-------|----------------------|-------|-------|-------|
| | 5-7 | 10-12 | 13-16 | Total | 5-7 | 10-12 | 13-16 | Total |
| <i>Number of boys judging,</i> | 32 | 52 | 91 | 175 | 31 | 54 | 52 | 137 |
| Drink, | | 6 | 8 | 6 | | 3 | 6 | 4 |
| Smoke, | | 34 | 24 | 23 | | 11 | | 5 |
| Swear, | 19 | 18 | 12 | 15 | 19 | 9 | 12 | 12 |
| Group total, | 19 | 58 | 44 | 43 | 19 | 23 | 18 | 21 |
| Lie, | | 2 | 4 | 3 | 12 | 11 | 16 | 13 |
| Cheat, | | 2 | 3 | 2 | | | 14 | 5 |
| Group total, | | 4 | 7 | 5 | 12 | 11 | 30 | 18 |
| Steal, | 3 | 16 | 25 | 19 | | 22 | 26 | 18 |
| Group total, | 3 | 16 | 25 | 19 | | 22 | 26 | 18 |
| Disobedience, | 19 | 2 | 6 | 7 | 12 | | 2 | 3 |
| Disrespect to parents, | | | 4 | 2 | | | 4 | 1 |
| Desert parents, | | 2 | | 1 | | | | |
| Play truant, | | 2 | | 1 | | 5 | | 2 |
| Whisper, | 12 | | | 2 | 6 | | | 1 |
| Not look on book, | | | | | 3 | | | 1 |
| Be lazy, | | 2 | | 1 | | 7 | 8 | 6 |
| Group total, | 31 | 8 | 10 | 13 | 21 | 12 | 14 | 15 |
| Have bad thoughts, | | | | | | 2 | | 1 |
| Gamble, | | | 1 | 1 | | | | |
| Deface property, | 6 | | 8 | 5 | | | | |
| Kill a person, | | 6 | 1 | 2 | | 2 | | 1 |
| Fight, | | 2 | | 1 | | 5 | 6 | 5 |
| Have matches, | 6 | | | 1 | | | | |
| Set fire, | 3 | | | 1 | | | | |
| Hurt people, | 19 | | | 3 | 19 | | | 4 |
| Get on track, | | | | | 6 | | | 1 |
| Go out in rain, | 3 | | | 1 | 13 | | | 3 |
| Group total, | 36 | 8 | 10 | 14 | 38 | 9 | 6 | 14 |
| Be out late, | | 2 | 1 | 1 | | 5 | 6 | 4 |
| Go with girl, | | 4 | 1 | 2 | | | | |
| Go with boy, | | | | | | 3 | 4 | 3 |
| Kiss a boy, | | | | | | 2 | | 1 |
| Be sauey, | | 2 | 1 | 1 | | 4 | | 1 |
| Run away, | 9 | | | 2 | 6 | | | 1 |
| Group total, | 9 | 8 | 3 | 5 | 6 | 14 | 10 | 10 |
| Sin, | | 2 | | 1 | | 5 | | 2 |

TABLE XXVIII

WHY FAULTS ARE WRONG, ACCORDING TO GIRLS

The numbers opposite each reason indicated at the left give the per cent. of girls, of each age, who assign this as the reason for the badness of the worst faults of girls and of boys.

| AGE | Faults of Girls | | | | Faults of Boys | | | |
|---------------------------------|-----------------|-----------|-----------|-----------|----------------|-----------|-----------|-----------|
| | 5-7 | 10-12 | 13-16 | Total | 5-7 | 10-12 | 13-16 | Total |
| <i>Number of girls judging,</i> | 34 | 43 | 108 | 185 | 34 | 49 | 47 | 130 |
| Public opinion, | 20 | 18 | 15 | 17 | 20 | 16 | 11 | 15 |
| Reputation, | | 9 | 16 | 12 | | 10 | 15 | 9 |
| Approval, | 18 | 2 | | 3 | 12 | | | 3 |
| Desire to please, | 32 | | | 6 | 32 | | | 8 |
| Group total, | 70 | 29 | 31 | 38 | 64 | 26 | 26 | 36 |
| Reverence, | | 2 | 6 | 4 | | | 2 | 1 |
| Home training, | | 7 | 11 | 8 | | | 7 | 2 |
| Wrong, | 26 | 7 | 5 | 9 | 29 | 4 | 6 | 10 |
| Ten commandments, | | 25 | 3 | 8 | | 14 | 4 | 6 |
| Group total, | 26 | 41 | 25 | 28 | 29 | 18 | 19 | 21 |
| Character, | | | 12 | 6 | | | 19 | 6 |
| What it leads to, | 3 | 16 | 29 | 21 | | 30 | 36 | 24 |
| Group total, | 3 | 16 | 41 | 29 | | 30 | 55 | 31 |
| Punishment, | | 12 | 2 | 3 | 5 | 24 | | 11 |
| Group total, | | 12 | 2 | 3 | 5 | 24 | | 11 |

TABLE XXIX

WHY FAULTS ARE WRONG, ACCORDING TO BOYS

The numbers opposite each reason indicated at the left give the per cent. of boys, of each age, who assign this as the reason for the badness for the worst faults of boys and of girls.

| AGE | Faults of Boys | | | | Faults of Girls | | | |
|--------------------------------|----------------|-----------|-----------|-----------|-----------------|-----------|-----------|-----------|
| | 5-7 | 10-12 | 13-16 | Total | 5-7 | 10-12 | 13-16 | Total |
| <i>Number of boys judging,</i> | 32 | 55 | 86 | 173 | 31 | 53 | 50 | 134 |
| Public opinion, | 3 | 9 | 10 | 9 | 10 | | 28 | 12 |
| Reputation, | | 5 | 7 | 5 | | 2 | 22 | 8 |
| Approval, | 15 | | | 3 | 10 | | | 2 |
| Group total, | 18 | 14 | 17 | 16 | 20 | 2 | 50 | 23 |
| Reverence, | | | 6 | 3 | | 17 | 4 | 8 |
| Home training, | 12 | 7 | 11 | 10 | 6 | 14 | 10 | 10 |
| Wrong, | 46 | 5 | 4 | 12 | 46 | 10 | 10 | 19 |
| Ten commandments, | | 18 | 2 | 7 | | 4 | | 1 |
| Group total, | 58 | 30 | 23 | 32 | 52 | 45 | 24 | 40 |
| Character, | | 7 | 13 | 9 | | | | |
| What it leads to, | 12 | 29 | 39 | 33 | 3 | 29 | 26 | 22 |
| Group total, | 12 | 36 | 52 | 40 | 3 | 29 | 26 | 22 |
| Punishment, | 9 | 11 | | 5 | 16 | 21 | | 12 |
| Group total, | 9 | 11 | | 5 | 16 | 21 | | 12 |
| Humanitarianism, | | | 1 | 1 | | | | |
| Prudence, | | | 3 | 2 | | | | |
| Virtue, | | 12 | | 2 | | | | |
| Example, | | | | | 6 | | | 1 |
| Group total, | | 12 | 4 | 4 | 6 | | | 1 |

THESES XVI AND XVII

Thesis XVI., by Frances Denis Smith, and Thesis XVII., by Grace I. Davis, were based on the study of individual children. Space can be spared to quote only the definitions given by the little girl studied by Miss Davis for several years.

When she was five, she defined school thus:

"School is made of brick and it is big."

At ten she says: "School really is a place to learn. You have to go to school until you are fourteen and when you have examinations, that's what shows how much you know. I have just had mine and I got E in them all."

At five—"Bee is a bird that I never see."

At ten—"Bee is larger than a fly and buzzes louder. It has one eye right in the center of its face and a hair horn each side of it. It has yellow on its tail and it will sting, anyway the one I did see did."

At five—"Lady is a growed up woman."

At ten—"A lady is anyone that knows good manners and uses them, that is what my father says is a lady."

At five—"Water is what we drink and you can't pick it up and you can't hold it in your hands at all. It runs way off with the dam and it can swim and float along and it is water."

At ten—"Water is a liquid. It isn't white but it is the color of glass and it looks like glass. It comes from the clouds and makes rivers. Rivers have whirly places that drown people. We could not live without water."

At five—"Dogs have four legs. Some have long hair and some have not. Some are big dogs and some are just little pups."

At ten—"A dog is a little four footed animal and knows more than any other animal I know. St. Bernards save people."

At five—"A fish has six wings, two eyes and a mouth, and a flat back and some are gold fishes and have a head—about a hundred inches long and it flies into the water and has two cuts in the sides of the head and these cuts shake all the time."

It might be well to add that when she formed this definition she had a globe containing gold fish before her.

At ten—"A fish has a long fin on its back and three on the underside and lives in water. It has a place cut on each side where it breathes and its mouth is most always moving."

At five—"A chicken is a little hen—wears white stockings and is good for white eggs."

At ten—"A chicken is a little hen, some people call them fowls. The hens lay eggs and if they are not too lazy hatch them into chickens."

At five—"Pride is to feel funny."

At ten—"Pride, well people that are proud think they are smart and make a lot of motions and people don't like them."

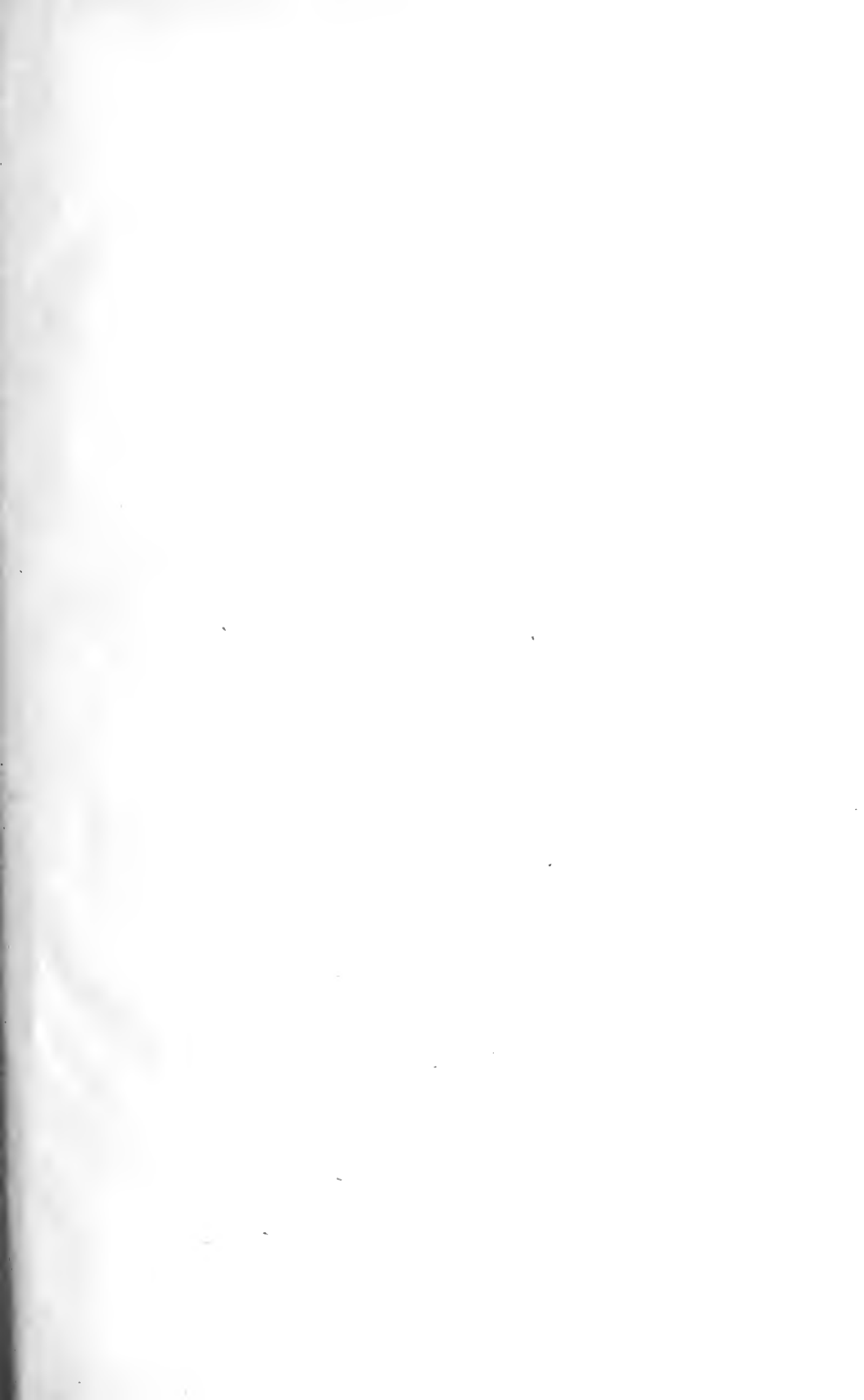
At five—"Moss is the most like grass or hair of anything I know of."

At ten—"Moss is damp green stuff. It doesn't grow as high as grass. Spanish moss is gray like gray hair and grows long and is stringy and hard to break."

At five—"Man, first God borns them and they are little and cry and grow until a hundred and seventy years if they don't die before, sometimes they do."

At ten—"A man is a master. A fellow is not a man until he is thirty-five or forty years old. Some men wear glasses, some men are five feet, six inches tall, some are fat and some are slim. Men have short hair and some of them have mustaches. You can tell a man from a woman by his dress and hat and he looks cross."











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